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THE FOUNDRY

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G. H. GARDNER, PRESIDENT AND TREASURER.
JOHN A. PENTON, VICE-PRESIDENT.
A. I. FINDLEY, SECRETARY.

JOHN A. PENTON,
HENRY M. LANE, } - - - - - - - Editors.

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TRADE OUTLOOK.

A slowing down of foundry operations has been observed throughout the month of October. Much malleable work that is ordinarily placed in the summer is still uncontracted for, buyers in this line, as in others, desiring to know more about the outlook before making commitments. Agricultural machinery manufacturers have placed orders for some of their malleable requirements, but railroad and car shop contracts in this line are slow coming. Jobbing foundries in general are looking for work. Stove foundries have been busy as a rule. The change in business conditions has been reflected in the labor situation. The number of idle molders has increased in the month and there is a notable lessening of strikes. A number of such troubles, notably the one at Birmingham, Ala., have come to an end, and the situation is clearer in this respect than in many months. It is realized by the foundry trade that the period of important industrial extensions is over and that comparative quietness may be expected for the balance of the year, with no great activity probable in the presidential year. This situation is being faced philosophically and without any panicky feeling. It is simply a case of resting after a period of intense sustained activity. The crop round-up is highly gratifying on the whole, and Western railroads are assured of a winter of heavy traffic. With so much cotton, wheat and corn to send to market at good prices, particularly for cotton, the farmer's lot is an enviable one—a condition that never has produced or accompanied serious depression in industry. The past week has brought a further decline in pig iron following the disruption of the Southern Pig Iron Association. There had been rumors of cutting below the agreed prices for some time, particularly in Central and Western territory, and two important concerns finally gave notice of withdrawal. The formal breaking up of the association was followed by the widespread quotation of $10.50 Birmingham on No. 2 foundry iron, and the sale of 20,000 tons of iron by one interest holding the largest stocks. Much of this iron went to Chicago and other Western districts, and all members of the association made freer sales than in months. The level reached in this open competition is not entirely clear, but producers are known to have made a price of $10.25 at furnaces from which the freight to the North is 25 cents less than from Birmingham, thus making the equivalent of $10 Birmingham. No exports have yet been made, but negotiations are under way. The lowest freight rate yet quoted on export iron from Birmingham (early November selling) is $3.25, as against a range of $2.50 to $4 in the last export movement. With the $2.50 rate, which should again be available in case any considerable export movement is assured, No. 3 iron from Birmingham could compete in Manchester, Eng., if sold at about $9 at furnace. Northern furnaces will now be compelled to reduce prices if they meet the Southern competition on the newly established basis, No. 2 Southern iron having been sold delivered in Northern Ohio at $14.10. In the Pittsburg district No. 2 foundry has sold at $14.75.

The New Foundry and Pattern Department of the B. F. Sturtevant Co., Hyde Park, Mass.

For several years the B. F. Sturtevant Co. has felt the excessive pressure of increased business and the necessity for much more extended facilities for manufacturing than were possessed by its old plant at Jamaica Plain, Mass. The fire which visited this plant in 1901 had the effect of definitely settling the question of removal and plans were immediately begun for a thoroughly modern manufactory at Hyde Park, about 9 miles from Boston, where an abundance of skilled labor is always available.

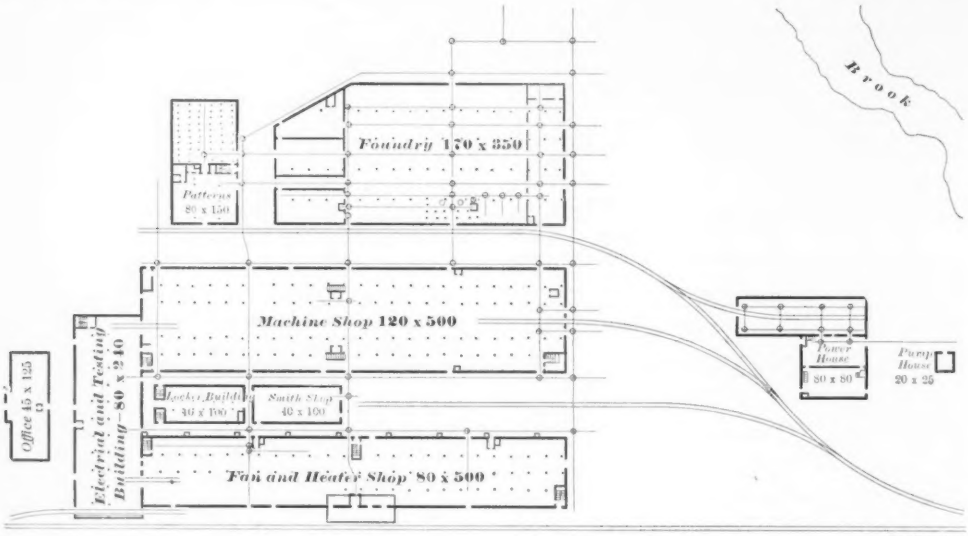

Brook
Foundry 170 x 350
Patterns 80 x 150
Machine Shop 120 x 500
Power House 80 x 80
Pump House 20 x 25
Office 45 x 125
Electrical and Testing Building—80 x 240
Locker Building 40 x 100
Smith Shop 40 x 100
Fan and Heater Shop 80 x 500
The Foundry

FIG. 1.—PLAN OF THE B. F. STURTEVANT CO.'S WORKS, HYDE PARK, MASS.

The site selected was admirably adapted for the requirements; the tract of land contains over 15 acres and has a frontage of 1,300 feet along the freight yard tracks of the New York, New Haven & Hartford Railroad, near its station at Readville. The water supply is ample and the space for dumping waste is sufficient to meet all requirements for years to come.

The general layout of the plant is shown in Fig. 1 and comprises a commodious four-story office building, measuring 45x125 feet, a three-story building 80x500 feet devoted to the manufacture of blowers, heaters and galvanized iron work; a building 80x240 feet of the same height, on the first floor of which all engines will be tested, stored and shipped, while the other floors will be utilized by the electrical department; a general machine shop measuring 120x500 feet, with 40-foot side galleries, devoted principally to the building of engines; a forge shop 40x100 feet; a two-story building of the same floor area devoted exclusively to lockers, washing and sanitary facilities for the employes; a pattern and storage building 80x150 feet in ground plan; a foundry measuring 170x350 feet; a power house 80 feet square with detached fire and service pump house. All told, the aggregate floor area of the buildings exceeds 9 acres. Brick has been used for all walls; steel columns and girders form part of the construction of such buildings as are equipped with traveling cranes; all upper floors are of plank with top course of maple laid on heavy wooden beams and designed in the case of the principal buildings for carrying safe loads of 200 to 250 pounds per square foot. The roofs are of heavy plank covered with tar and gravel.

The arrangement of the buildings is the result of the most careful study and endeavor to simplify to the limit the matter of inter-transportation. Numerous spur tracks permit of ready handling of in-coming and out-going freight, while a complete system of industrial railways connects all departments. The industrial system is equipped with 12-pound T rails laid 24 inches gauge on centers, with turntables, trucks, cars, etc., all of which were

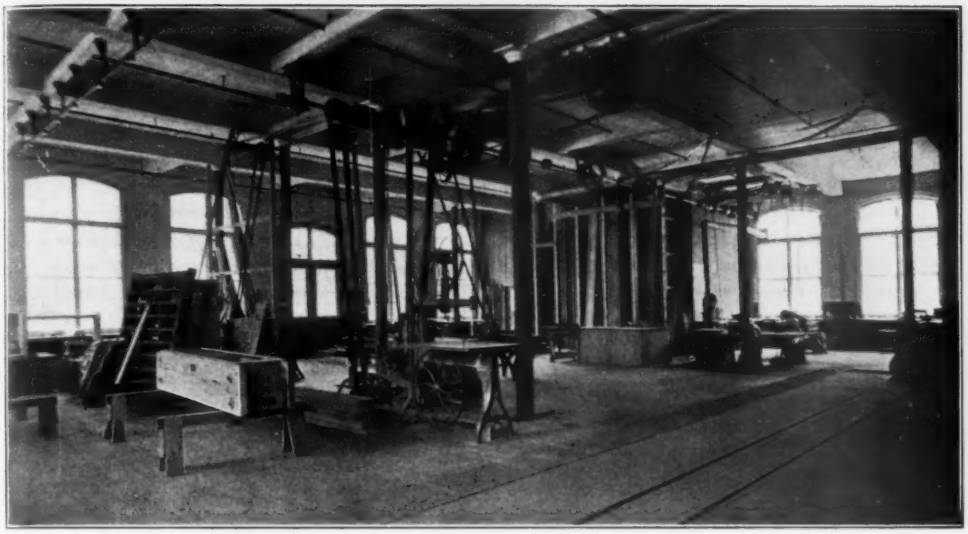


FIG. 2—FLASK ROOM.

specially designed and made by the Sturtevant company.

The foundry and pattern departments which form the subject of this description were the first to be put in operation prior to the removal of the entire plant from Jamaica Plain.

The Pattern Building.

The pattern building is divided midway of its length by fire walls enclosing stairs, elevators, etc. One-half the building, with stories respectively 17 and 15 feet, is devoted to the flask and pattern making rooms, while the other half, provided with intermediate floors, making four in all, is utilized for pattern storage.

The flask shop, Fig. 2, measuring about 60x80 feet, is equipped with band, cross-cut and splitting saws, boring machines and lathe, all driven by a 10-horsepower Sturtevant motor suspended from the ceiling. The industrial railway runs directly into this room from the foundry across a distance of about 40 feet, and together with an over-head transfer truck reduces to a minimum the cost of handling

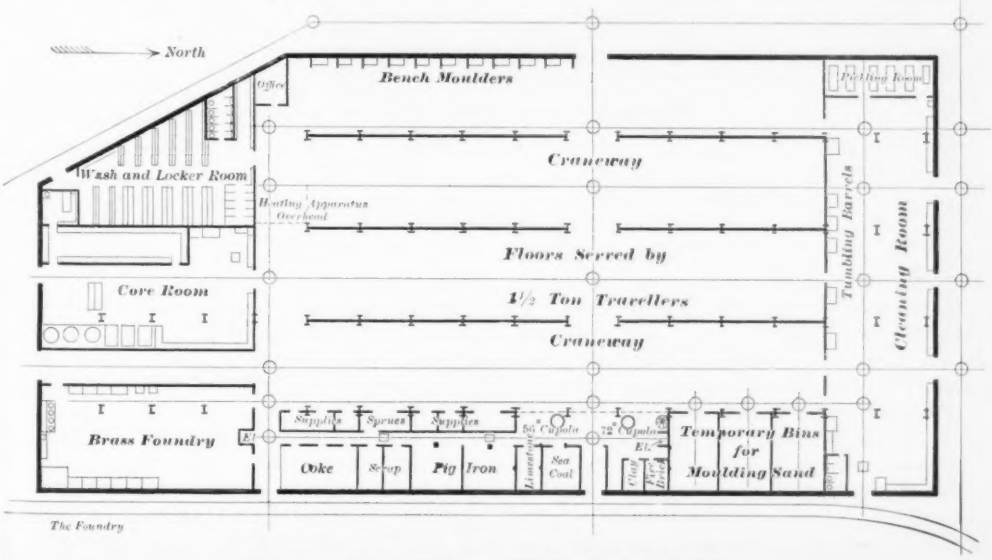


FIG. 3—PLAN OF THE B. F. STURTEVANT CO.'S FOUNDRY.

flasks. The lumber for their manufacture is unloaded from cars directly in front of the building. This room also includes the metal pattern makers' department equipped with the necessary machine tools. Adjacent thereto is the locker, wash and toilet room for the building.

Immediately above is the pattern shop, abundantly lighted on three sides and equipped with a full complement of tools, including one single and two double saw benches, two band saws, a buzz planer, and a double surfacer, five lathes, one of which is a 66-inch by 11½-foot gap lathe, a drill press, a core box machine, numerous wood trimmers, etc. All the power machines are operated by two 10-horsepower Sturtevant motors, both being required for ordinary work, but one always serving as a possible relay in case of accident.

The benches, which accommodate two men each and measure 2 feet 6 inches in width by 16 feet in length, are so arranged along the sides of the building that the men all receive a left-shoulder light. Behind each bench is a working table 4 feet by 16 feet in dimensions. The benches are supported upon cast-iron legs of special design, which were built by the Sturtevant Co. and are used throughout the plant. They are equipped with Emmert vises and their tops are of heavy maple plank. A warming chamber for glued work is provided, which receives warm air through the general heat flue from a Sturtevant heating apparatus below.

Around the pipe columns which support the floors of the pattern storage end of the building are clamped the pattern shelving brackets which are adjustable to any height. All patterns are consecutively numbered upon the drawings as made. When delivered to the pattern storage department proper locations are assigned and records thereof made upon cards, one for each pattern. These cards are filed in the order of the pattern numbers. Four figures with the addition of a letter are in every case sufficient to locate a pattern. A given location, for instance, may be 2125B; that is, it is upon the second floor, as shown by the first numeral "2;" it is the twelfth row of shelves and the fifth division of that

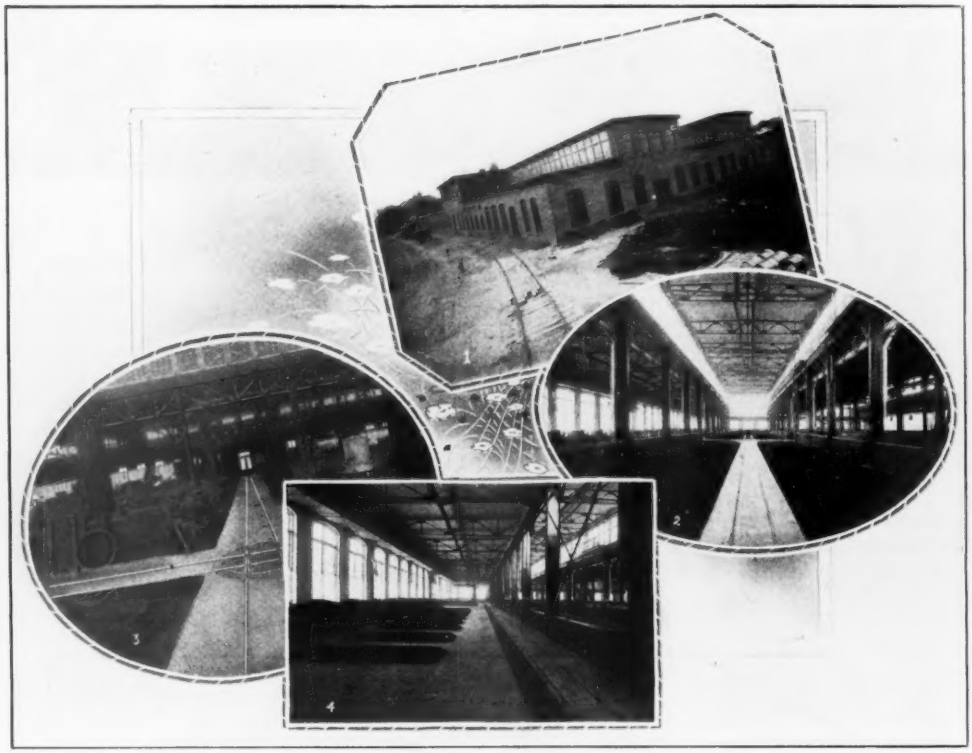


FIG. 4.—1. FOUNDRY AND PATTERN BUILDINGS. 2. WEST CRANE-WAY, LOOKING NORTH. 3. FOUNDRY INTERIOR, LOOKING EAST, FACING CUPOLAS. 4. WEST SIDE OF FOUNDRY, LOOKING NORTH.

row, as shown by the succeeding numerals "125," and on the B level, the floor being designated A, and the letters B, C, D, etc., indicating the shelves in their order above.

The first floor is of concrete and is designed for the keeping of heavy cast iron patterns. It is served by an industrial railway and turntable, which permits of transfer to the elevator and thence to other floors. Communication between the pattern shop and storage department is direct, while the fire risk is reduced to a minimum by a double system of fire doors.

The moulder's written order to make a specified number of castings is issued by the foundry office, directly to the pattern keeper, who makes record thereon of the pattern location, attaches it to the pattern and sends both to the foundry. A metal clip placed upon the storage record card indicates that the pattern it out.

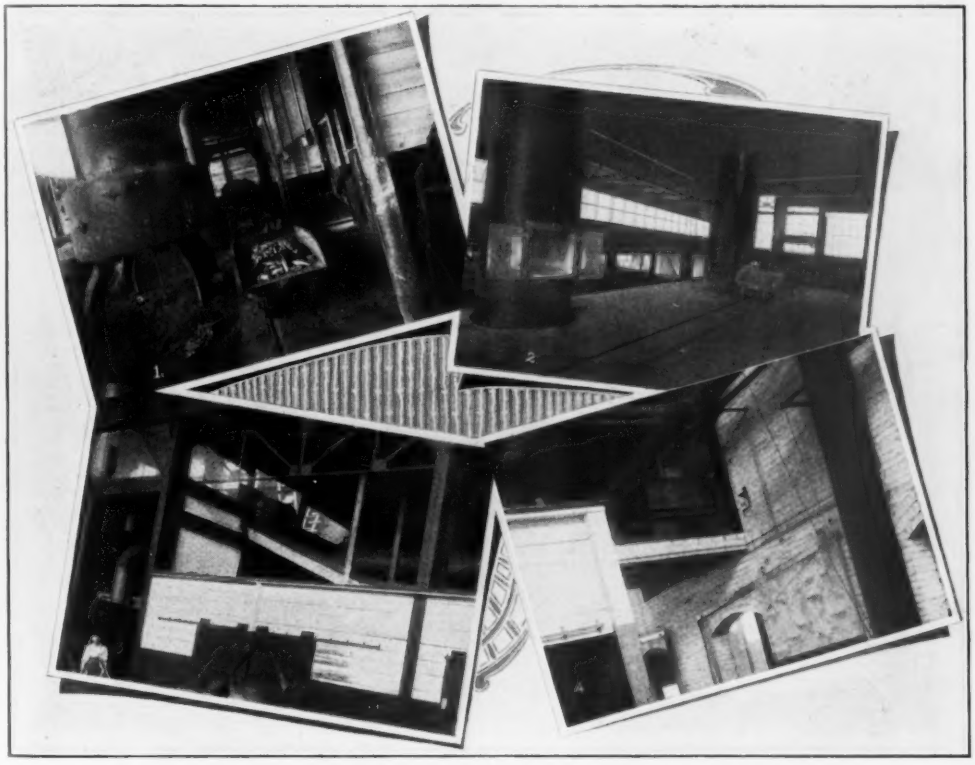


FIG. 5.—1. CHARGING CARS IN FRONT OF BINS. 2. CHARGING CARS ON CHARGING FLOOR. 3. CHARGING CAR ENTERING CHUTE. 4. CHARGING CAR ENTERING DROP ELEVATOR.

The Foundry.

The general plan of the foundry is shown in Fig. 3. It consists essentially of two long craneways each 35 feet in width, with a center bent of the same width and side floors 30 feet wide. The brass foundry, core room and wash room are located at one end; the charging floor at one side, nearly midway of the length, and the cleaning room at the other end. The craneways are designed for 20-ton electric traveling cranes. Those already installed are of the Whiting Foundry Equipment Co.'s make and are equipped with Sturtevant motors. Fig. 4 shows an exterior and three interior views of the foundry.

Brick division walls three and one-half feet high running lengthwise of the foundry separate the floors on the lines of the columns. Lighting is secured through monitors in both of the craneways and through ample side windows. Each line of monitor transoms is operated in unison by a novel device installed by the G. Drouve Co. The western side of the foundry is given up to bench and small floor moulding, the bench moulders' floors being separated at the bench ends by wooden partitions. The floors throughout this side of the building as well as those in the storage bins and center runways are of concrete. Alongside the industrial railway, which serves iron

from ladle trucks to the bench floors, is a sunken trench laid with common brick as a suitable place for drippings and for the piling of hot castings.

tribution of metal, etc., to all parts of the building. The floor between the craneways is supplied with a series of 1½-ton small traveling cranes of about 10-foot span equipped with

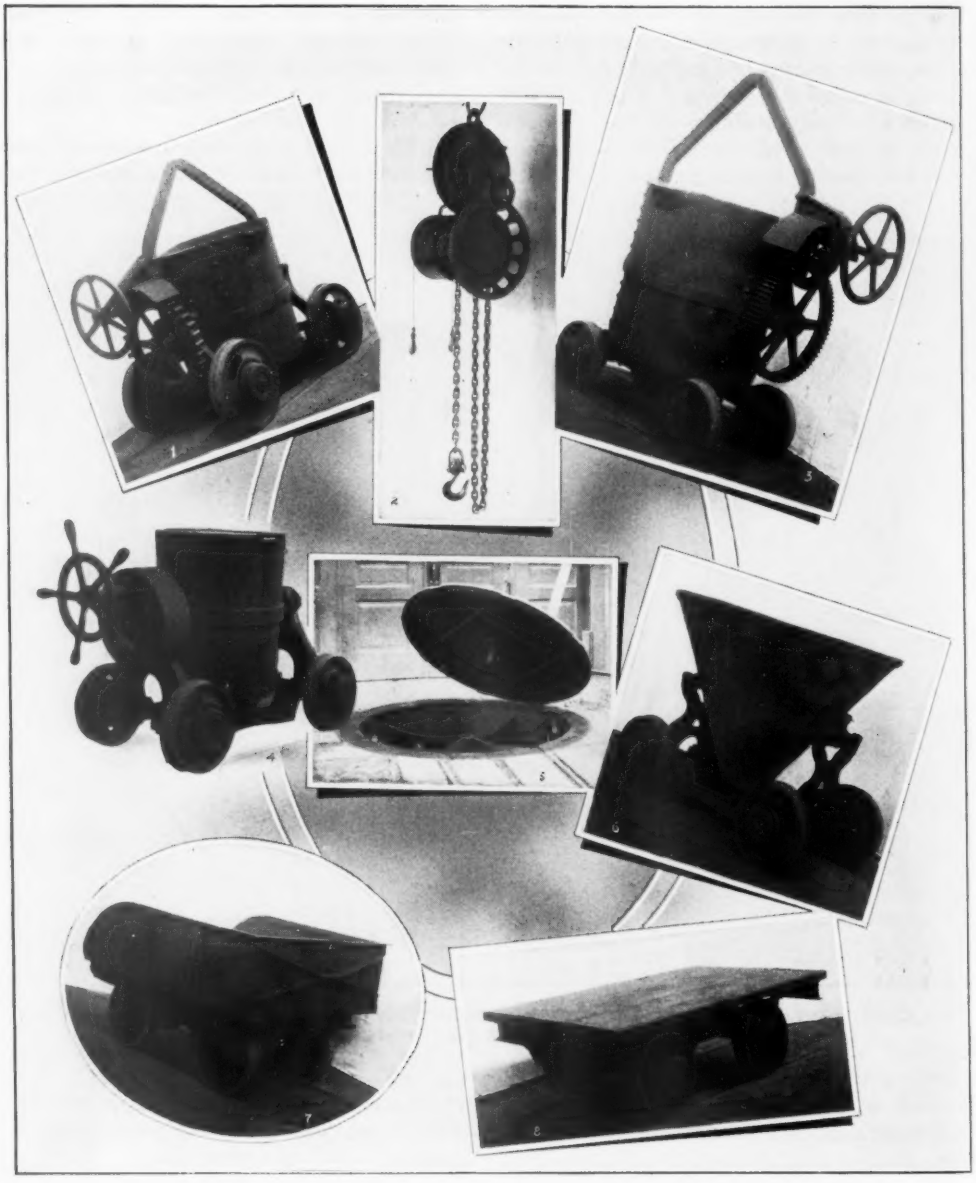


FIG. 6—1 AND 3. TRANSFER TRUCKS FOR CRANE LADLES. 2. ONE-TON ELECTRIC HOIST. 4. ONE-TON SPUR GEAR LADLE TRUCK. 5. TURN-TABLE FOR INDUSTRIAL RAILWAY. 6 DUMP CAR. 7. CHARGING CAR. 8. TRUCK CAR.

In the center line of each of the craneways and in the bent between them runs an industrial railway with turn-tables connecting with the cross-aisles, which provides for the dis-

Sturtevant electric hoists built especially for this work.

All materials are received from a track which runs along one side of the foundry and

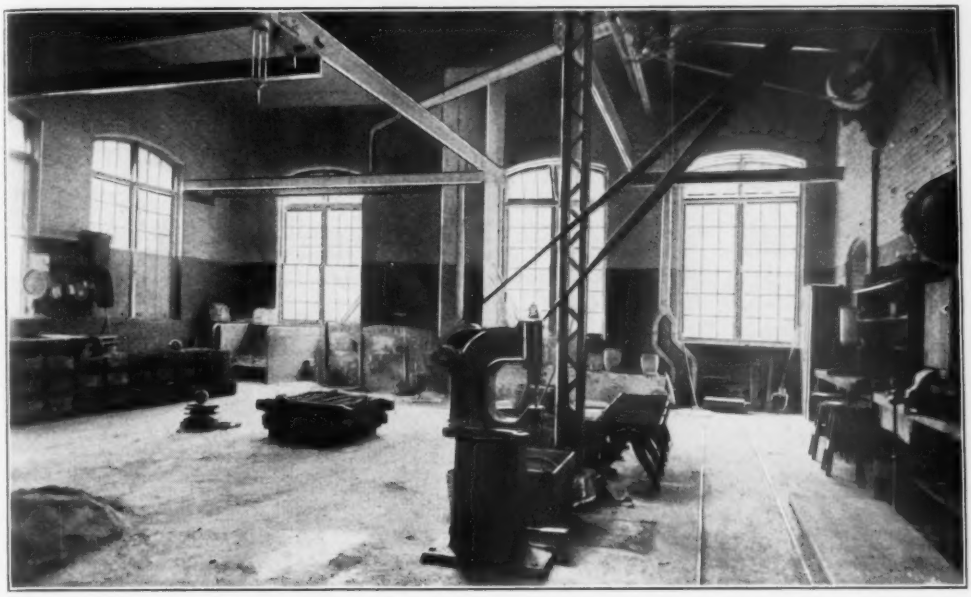


FIG. 7—INTERIOR OF BRASS FOUNDRY.

are delivered through wall openings in the bins which fill a portion of the side wing adjacent to the cupolas. For the present the sand storage bins and mixing room are also within this building.

Charging System.

An ingenious system of charging, illustrated in Fig. 5, has been devised, under which the charging cars pass at floor level in front of the bins, are there loaded with the requisite amounts, weighed, and passed to the elevator, where they are raised to the charging floor. As each car is unloaded it is pushed forward and started down an incline, whence it passes back in a direction opposite to that traversed while being loaded on the floor beneath. A novel apparatus gradually brings it to a standstill while yet upon the incline, and then releases it so that it may, by its own weight, roll on to an elevator which is automatically tripped and descends to the ground floor level. Here it is removed by one of the loading men

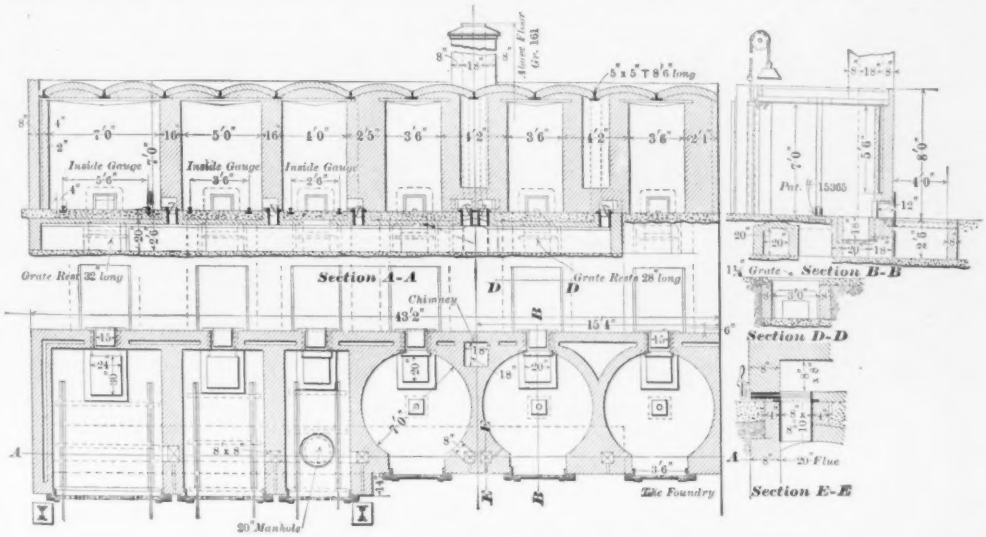


FIG. 8—CORE OVENS OF THE B. F. STURTEVANT CO.

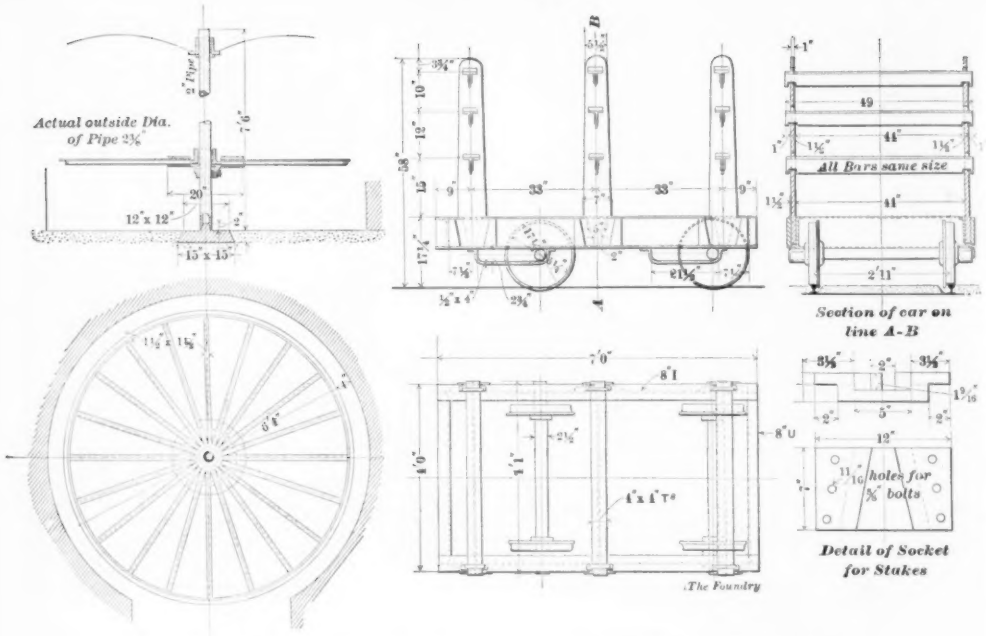


FIG. 9.—RACKS AND REELS FOR THE CORE OVENS OF THE B. F. STURTEVANT CO.

and the elevator returned to its place above ready to receive another car.

Cupolas.

The cupolas are two in number of Whiting make, 54 inches and 72 inches in diameter. The opportunity has been improved to show the eminent adaptability of the Sturtevant pressure blower; a No. 8 and a No. 10 blower driven respectively by a 30 and a 40-horsepower Sturtevant belted motor, being supported upon the charging platform through which they discharge directly downward and thence to the cupolas. It is intended to make this installation the subject of critical experiment for the establishment of important principles.

FIG. 10.—FOUNDRY CLEANING ROOM, LOOKING WEST.

Transportation Equipment.

The entire transportation equipment of the plant, including tracks, cars, trucks, etc., was designed and built by the Sturtevant Co. The tracks in the foundry are imbedded in the concrete runways, and all changes of direction are secured by turn-tables, there being no switches in the works, and therefore no radial truck cars, all cars having rigid bases.

The turn-tables and cars are shown in Fig. 6. The turn-tables are designed very heavy to avoid distortion or breakage and consist of a bottom frame with four roller wheels which are carried upon composition trunnions, and a cover, which is recessed for crossing tracks at right angles and provided on the underside with a chilled tread with which the wheels come in contact. A small idler wheel is provided which automatically stops the turn-table on each quarter, but readily releases it. The cover is accurately centered by a chilled conical bearing.

The cars are provided with a special type of ball bearing, practically devoid of machine work, but with chilled wearing surfaces. The ordinary flat cars, as well as the charging cars, are built up of structural steel. The geared ladle cars have malleable iron frames and enclosed spur gear mechanism. Similar construction is employed in the case of the transfer cars for geared crane ladles of medium size, while a simple low platform truck is utilized in the case of the largest crane ladles. The dump cars are in the form of inverted cones and so balanced as to be tipped with the utmost ease. The taper of the cone is such that these cars are practically self-dumping.

Brass Foundry.

The brass foundry, Fig. 7, is located at one corner of the main building. It is provided with four crucible furnaces and a special form of reverberatory furnace designed principally for the melting of babbitt or similar soft metals. An overhead traveler, with interlocking transfers on the side floors serves the entire area of the room. Blast for the furnace is furnished by a No. 3 Sturtevant monogram blower, and the entire machinery, consisting, in addition, of a sprue cutter, a magnetic separator, a tumbling barrel and emery wheels, is driven by a 5-h. p. Sturtevant motor attached to the wall. The entire floor is of concrete, in which is imbedded a section of the industrial railway communicating with the balance of the foundry.

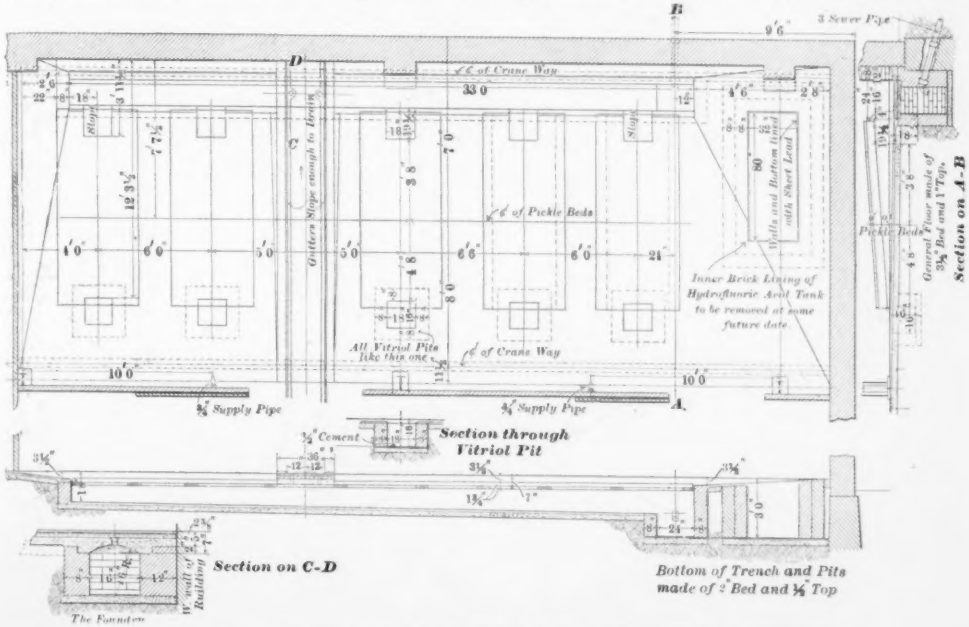

B
D
3 Sewer Pipe
9'6"
℄ of Crane Way
33'0
Gutters Slope enough to Drain
℄ of Pickle Beds
Inner Brick Lining of Hydrofluoric Acid Tank to be removed at some future date.
Walls and Bottom lined with Sheet Lead
Pickle Beds
General Floor made of 3½" Bed and 1" Top.
Section on A-B
All Vitriol Pits like this one
℄ of Crane Way
¾" Supply Pipe
¾" Supply Pipe
A.
½" Cement
Section through Vitriol Pit
Section on C-D
W. wall of Building
Bottom of Trench and Pits made of 2" Bed and ½" Top

FIG. 11.—PLAN OF THE PICKLE ROOM AT THE B. F. STURTEVANT CO.'S FOUNDRY.

Core Room.

In the middle of the end of the foundry is the core room. The ovens are six in number, three being 7 feet in diameter, of the reel type, and three being respectively 4, 5 and 7 feet in width by 8 feet 10 inches in length, provided

with cars. The core ovens are shown in Fig. 8 and the core racks and reels in Fig. 9. An overhead traveling crane serves these latter ovens and provides for the transfer of heavy cores to the industrial railway which passes through this room. A portion of the room is partitioned off and serves for the women core makers employed in this department. The floor is of concrete. The tops of the ovens are utilized for storage of cores upon a special rack of steel construction. A Blake wire straightener, together with a Hanna automatic shaker, are the principal machines in this room.

Cleaning Room.

At the other end of the foundry is the cleaning room, Fig. 10, through which run the longitudinal tracks from each main aisle of the foundry. A five-ton three-motor electric crane of the Whiting Foundry Equipment Co.'s manufacture, equipped with Sturtevant motors, serves the principal portion of the floor in this room. The tumbling barrels, six in number, are completely enclosed in housings of steel construction. These, together with a Sly cinder mill and several emery wheels, are driven by a 30-h. p. Sturtevant motor. A temporary air compressor located in one corner and driven by a Sturtevant motor, supplies air at 100 pounds pressure to chippers, rammers, hoists, etc., employed in connection with this work. The light and ventilation of this room are noticeably good.

Pickle Room.

Adjacent to the cleaning room is the pickle room, Figs. 11 and 12; the floors of both are concrete. The pickle beds are of teeter board construction, so designed that the acid may be drained back into the vats and the board subsequently teetered over for washing into the trench upon the other side of the room. The floor slopes so so as to give perfect drainage. A pneumatic traveling crane serves this room.

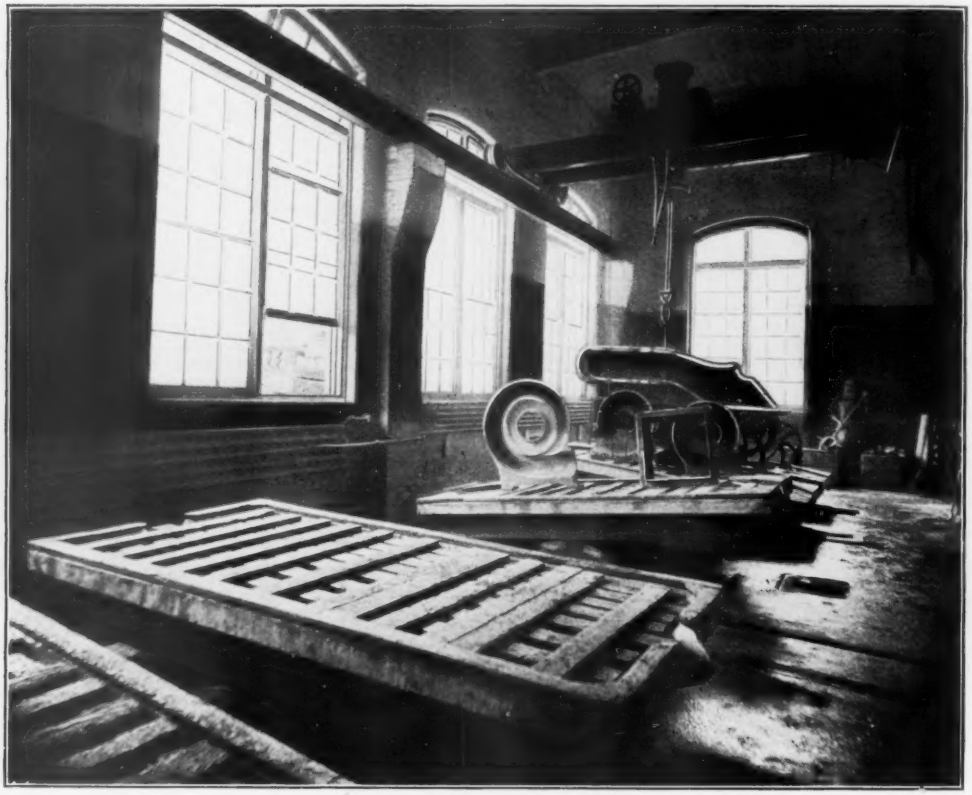


FIG. 12—PICKLE ROOM.

Sanitary Arrangements.

One of the notable features of the equipment of this plant is to be found in the sanitary ar-

rangements. Most generous provision has been made in the case of the foundry, which has a large locker and wash room, Fig. 13. Expanded metal lockers to the number of 225 are already in position. Enameled iron sinks, six in number, are served with tempered water and are generously patronized by the employes. A series of slate partitioned shower baths has proved to be very acceptable during the past summer. The floor of this room is of tar concrete; the upper walls and ceilings, which are white and fresh, are in pleasing contrast with the steel work and base of the walls, which are finished in rich dark green. Within the same room is installed the time recording system,

FIG. 13—WASH ROOM AND LOCKERS, LOOKING NORTH.

so placed that a double line of men pass, one upon either side of the board, as they go and come from the room. The foundry foreman has not been forgotten in the matter of convenience, and he, with his assistants, is provided with an attractive office, well lighted and susceptible of thorough ventilation from out of doors.

Naturally, the entire plant is heated and ventilated by the Sturtevant system. In the case of the pattern building, the apparatus consisting of an engine, driven fan and steel pipe heater is placed close to the division wall and delivers the heated air into a vertical flue and thence to the various rooms. The foundry apparatus is located overhead in the end of one of the craneways and arranged to take fresh air from out of doors or return from the building and reheat it. Distribution of air is made through a system of overhead galvanized iron piping, discharging downward to the floor. Both apparatus utilize exhaust steam. A complete underground tunnel system is provided for distribution of steam, electricity, compressed air, etc., and return of condensation.

PICKLING CASTINGS.

The pouring temperature of iron castings is so high that no matter what facing material is used more or less sand will adhere to the castings, and in many cases a scale, caused by the union of iron oxide and the sand, will be found covering the castings. Even when fairly free from sand, the castings are covered by a black oxide scale. This surface scale is very hard to cut in machining operations, as the sand contained therein grinds away the cutting tools while the oxide surface is extremely hard and will dull practically any cutting tool. For certain classes of work it is very important that this scale be removed and the most common method for doing it is by pickling the castings in an acid solution.

A number of different acids are used for pickling castings; probably sulphuric acid (oil of vitriol) is the most common. Hydrochloric and nitric acids are sometimes used.

Hydrofluoric acid is coming into very general use for pickling certain classes of castings.

The action of these different solutions is very different. Of the three acids, the first named, sulphuric acid, is the most commonly used, but the action of all three is alike. They will not attack the sand and the black or magnetic oxide of the scale, but by soaking through the scale they attack the metallic iron underneath and so undermine the scale, after which it falls off, or can be brushed or washed off. Sulphuric acid is the cheapest and in many ways the best of the three acids for this purpose. In its pure state sulphuric acid is a heavy liquid very much like an oil except it is very much heavier. In this condition it will not attack iron and in fact is frequently shipped in iron drums or tanks. When diluted in the proportion of one part sulphuric acid to from four to five parts of water, it will dissolve iron readily. In making up a pickle solution, the acid should be poured into the water a little at a time and the solution stirred vigorously during the operation. The addition of sulphuric acid to the water causes a rapid rise in temperature; the acid being heavier than the water sinks through it and by vigorous stirring can be made to mix thoroughly without any serious results. If, however, water is poured into the acid it will float on the surface at first, and when forced to mix suddenly by stirring it will be heated very quickly, forming steam which will practically cause an explosion, throwing some of the acid out of the vat or tub and probably injuring the workmen. On this account the method first mentioned of pouring acid into the water should always be followed. The sulphuric acid solution when used for pickling should be kept fairly warm, that is, at least between 70 and 80 degrees F. A solution made up in the proportion of one part suluphuric acid to from four to five parts of water will usually loosen the scale of the castings in one and one-half hours; sometimes one-half hour is sufficient.

Small castings are usually dipped into tubs or vats and in the case of larger castings, the acid is poured over them. After the castings have been pickled a sufficient length of time to remove the scale, they should be thoroughly washed with water. In some cases they are immersed in a hot solution containing a small amount of soda or potash. The soda or potash will neutralize any remaining acid and by leaving the castings in the water until they reach the temperature of the water, which should be about 200 degrees F. They will dry off quickly when taken out, while if they are washed in cold water the water will dry from them slowly and cause them to rust.

In some cases castings are left in the sulphuric solution over night and in that case the solution should be mixed in the proportion of one part of sulphuric acid to 10 or 15 parts of water.

The objection to pickling with sulphuric acid is that the scale is removed by undermining it and hence the portions of the iron which are covered with the most porous scale will be attacked most; also if there are any porous or soft places in the castings, the acid will settle in these and weaken the interior of the piece. When the castings are to be nickel plated or galvanized, it is not best to pickle them in sulphuric acid.

If concentrated sulphuric acid comes in contact with the flesh it will cause a very painful burn. In such a case as this it is best to neutralize with soda or ammonia and then wash with plenty of water. After this some healing solution should be used, such as collodium or a mixture of linseed oil and lime water.

The action of hydrofluoric acid in pickling is different from any of the above mentioned acids. Hydrofluoric acid acts but slowly upon pure iron, but will dissolve sand or black oxide of iron rapidly, hence the hydrofluoric attacks and dissolves the scale, thus leaving the castings clean. Hydrofluoric acid is commonly 30, 48 or 52 percent pure, the balance of the solution being water. When the 30% acid is used the pickling bath should be made up by taking 1 part of hydrofluoric acid to 20 parts of water; when the 48% acid is used the bath should be made up of 1 part of hydrofluoric acid to from 30 to 40 parts of water. The hydrofluoric acid bath is used cold but it should be kept above the freezing point. It usually takes from a half hour to one hour to remove scale from ordinary castings with the solution of the strength mentioned above. After the castings are taken from the hydrofluoric acid they should be rinsed in hot water, and as in the case of sulphuric acid, soda or potash are frequently added to the water to neutralize any acid that may remain.

If hydrofluoric acid come in contact with the flesh it will penetrate the skin immediately. Hydrofluoric acid when in concen-

trated or dilute form will destroy the finger nails very rapidly and hence the hands should be kept out of the hydrofluoric pickling bath, the castings being handled by means of wooden boxes or frames.

When it is necessary to handle the castings with the hands rubber gloves should be used. These precautions which have to be taken in using hydrofluoric acid probably explain the reason it has not come into more general use for pickling castings.

The dilute sulphuric acid solution has practically no effect on the hands except that it will make the skin rough. In another part of the present number in the description of foundry and pattern departments of the Sturtevant Co. a very good pickling room is illustrated. In this room several tilting tables are arranged for pickling castings with sulphuric acid. The castings are arranged upon tables so as to tilt them toward the vitriol or sulphuric acid tank. The acid is then dipped over the castings and the surplus allowed to drain back into the tank. After the scale has been removed the tables are tilted in the opposite direction and the castings washed with a stream of water from a hose, the water being allowed to flow into a launder provided for the purpose. At one end of the room a lead-lined hydrofluoric acid tank is provided.

The tanks for containing sulphuric acid pickling solutions should be lined with lead or made of wood, preferably lined with pitch or asphalt. The tanks for hydrofluoric acid are preferably lined with lead, though the dilute solution can be kept in wooden tanks. Hydrofluoric acid must be kept in wood or lead on account of the fact that it would dissolve glass bottles or stone jars. Hydrofluoric acid is almost universally used where castings are to be nickel plated.

DEFECTIVE CASTINGS FROM DIRTY IRON.

Referring to an article appearing in the October issue of *The Foundry* on this subject, the writer does not agree with Mr. Wüst regarding the presence of iron oxide combining with silicon and manganese. If this theory be true we might expect the dirtiest castings from metal containing the most silicon and manganese, whereas we know the contrary to be the case. The foundrymen know that, as a rule, soft iron is cleaner than hard iron. If Mr. Wüst's theory is correct we would find a difference in the silicon and manganese between chilled iron and gray iron in the same casting, the chilled iron having set almost instantly in coming in contact with the chill, while the gray body is still fluid and has had an opportunity to relieve itself of silicon and manganese. We know that the contrary is true. In castings partly chilled and partly gray the chilled iron is almost invariably the cleanest.

Melted iron undoubtedly contains gases coming from the combustion of the fuel in the cupola, and if the iron is dull or very hard these gases do not have an opportunity of escaping entirely and appear in the castings as blow holes. The greater the fluidity, which means the greater the amount of total carbon with sufficient silicon in the iron, the cleaner the castings, provided the iron is properly melted and skimmed, and provided the mold is clean. Dirty iron is nearly always chargeable to improper melting of the iron or handling of the cupola, or improper lining of the ladles, together with imperfect skimming.

The writer has seen clean iron come from remelted stove plate containing 15 percent of iron oxide and other impurities. Fluid iron and slag, if melted with the proper and sufficient amount of fuel, cannot mix and stay mixed on account of the difference in specific gravity, the iron being more than twice as heavy as the slag. Melted iron, especially hard iron, will oxidize on the surface when exposed to the air in the ladle, and at the same time gases taken up during the melting will come to the surface as bubbles, making it appear as though the slag was continually rising. As a matter of fact, the slag, if there at all, was with the iron when it came from the cupola, and, owing to the difference in specific gravity, it separated as soon as the metal reached the ladle. There are cases where, owing to insufficient fuel in the cupola, or from bad fuel the blast oxidizes the melted iron to such a degree as to start a chemical reaction between the iron and the oxidized iron. This reaction can be seen by melting old annealing pots with too little coke and soft iron. The scale or iron oxide adhering to the pots reacts on the silicon and carbon in the melted iron, and the result is dirty castings full of blow holes. Under normal conditions, such cases do not occur and the writer is firmly convinced that in most cases dirty iron is due to either improper melting or skimming and not to the presence of iron oxide reacting on silicon and manganese, as Mr. Wüst believes.

CHARLES H. VANNIER.

Foundry Plant of Maher & Flockhart at Newark, N. J.

In any line of industry it is one thing to modernize by building all new works where the latest improvements may be readily incorporated and provisions for expansion allowed, but it is quite another matter to keep an old plant abreast of the advancing times and its facilities adequate for the increasing demands upon its producing capacity. The foundry of Messrs. Maher & Flockhart, in Newark, N. J., is an example of a success in the latter class, for while it had its beginning in a small way with only such means as that time afforded, it is today conducting a large business on a profitable basis, due to the fact that the owners are alive to the advantages of improved methods and perfected machinery.

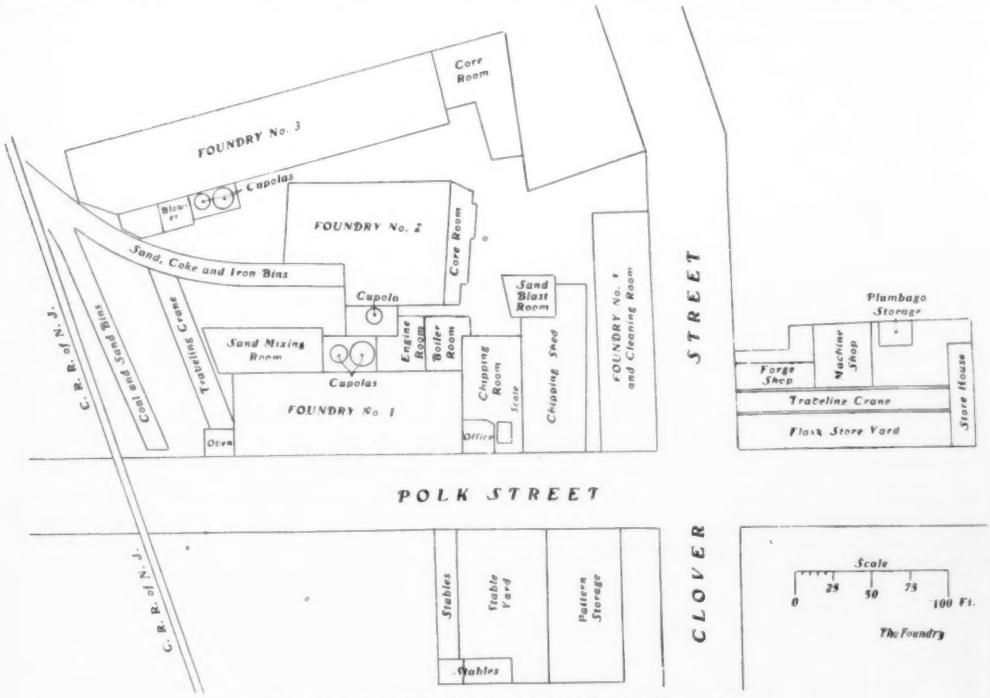


FIG. 1—PLAN OF THE FOUNDRY OF MAHER & FLOCKHART.

The original works erected in 1882 occupied a space about 100 feet square, on the corner of Polk and Clover Streets, Newark. Since that time they have been extended on all sides until they now cover an area of 2½ acres, the regular layout of which is shown on an accompanying plan, Fig. 1. The apparent lack of system in the arrangement of parts was the unfortunate but unavoidable consequence of this bit by bit growth. Each addition was made in what was considered at the time the most advantageous manner, although the outcome as a whole has not proved all that could be desired. However, the disadvantages of the worst locations have been largely removed by installing conveying appliances, both out of doors and in, in the shape of industrial railway tracks and communicating cranes.

One of the neatest features contributing to convenience is the scheme for delivering supplies into the yards by freight. The tracks of the Central Railroad of New Jersey pass close to the grounds, and being elevated to avoid grade street crossings through the city, were easily connected with two spur trestles which branch into the yard. Beneath the trestles are numerous storage bins into which the contents of the cars may be dumped directly, giving a selective distribution and requiring no handling of the material until it is needed for use. Under the trestle terminating near shop No. 2 are bins for the following: Jersey clay for clay-wash; kaolin for furnace and ladle linings; sand for sand-blast; soft coal for the boilers; coke and pig iron. The other line of bins is used to store stove coal for the core ovens; soft coal for the boilers; Jersey sand for dry-sand work; fire sand; Albany sand

and Waterford sand for greensand molds. There are also two narrow bins, or chutes, secured on the outside of the larger ones, which are used to hold sea coal and flour. A sufficient stock of coal, sand, etc., is always carried in storage to cover a period of four months and avoid shutting down for anything but a prolonged failure to receive supplies.

Shops Nos. 1, 2, 3 and 4, indicated by those numbers on the plan, are the largest buildings and constitute the foundries. Foundry No. 1 produces all of the largest castings, some of them weighing as high as 14 tons; No. 2 is used only for small castings, and No. 3 provides for intermediate sizes up to two tons. Primarily, No. 4 was intended for a cleaning shop, but it has been necessary of late to utilize it also as a foundry for castings under eight tons in weight. The remainder of the buildings include the engine and boiler plant, machine shop, numerous cleaning rooms, core rooms, pattern shop and storage rooms, stables, etc.

The engine and boiler plant located near the center of the group, though one of the smaller

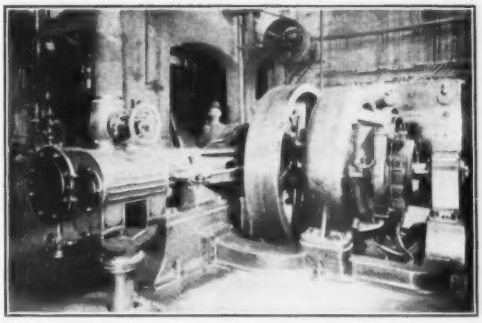


FIG. 2—ELECTRIC PLANT.

parts, is nevertheless of prime importance since it is the source of power upon which all else is dependent. The rooms are side by side, separated by a brick wall. In the boiler room are two Coatesville tubular boilers, one of 150-boiler horsepower, is 72 inches in diameter, 19 feet long, and contains 100 3½-inch tubes. The other has a capacity of 125 horsepower, is 66 inches in diameter, 19 feet long and contains 100 3-inch tubes. A 40-inch sheet-iron breeching conveys the gases of combustion from the boilers to the base of a stack of the same ma-

FIG. 3—FOUNDRY NO. 1, MAHER & FLOCKHART.

terial and diameter, 108 feet high. Steam is generated at a pressure of 100 pounds and conveyed by short lines to the steam-consuming apparatus, all of which is located in the adjoining room, consequently there is very little lost by condensation in the steam piping.

The engine room contains two steam driven air compressors; a Harrisburg standard horizontal high-speed 15½x16-inch engine, direct connected to a Crocker-Wheeler 100-kilowatt, direct-current generator; and a 13x12-inch, 150-horsepower Ball engine running at 275 revolutions per minute and driving a line shaft from which are belted a Benj. F. Kelley & Son duplex, single-acting, 6x6-inch boiler feed pump; a Crocker-Wheeler 30-kilowatt, compound wound 125-volt generator, running at 800 revolutions per minute; an Ingersoll-Sergeant 8x8-inch double-acting air compressor, at 125 revolutions; and a B. F. Sturtevant No. 9 horizontal-bottom-discharge blower. A No. 8 Sturtevant blower, belt-driven by a Crocker-Wheeler 45-horsepower motor, completes the apparatus found in the engine room. This blower provides forced draft for the cupola which supplies foundry No. 2, and the No. 9 blower serves whichever furnace is in operation in foundry No. 1. The Ingersoll-Sergeant and one of the steam-driven compressors, a Clayton 10x10x13-inch pump, running at 150 revolutions per minute, both deliver into a 3x6-foot cylindrical tank which supplies all pneumatic hoists, chipping tools, etc. A pressure governor on the steam supply of the Clayton compressor automatically maintains the pressure within the tank at about 80 pounds, while the belted compressor runs continuously. Similarly the boiler feed pump is in constant operation, it having been found cheaper to short-circuit the cylinders when the required water level in the boilers is reached, than to provide for stopping and starting attendance. This is accomplished by an automatic by-pass, which allows the water to surge back and forth between the alternately-acting cylinders at a small waste of power, the speed being but 18 revolutions per minute. In case the pump becomes disabled the boilers may be fed by an injector. City water is used for the feed as the water from the artesian well under the engine room is unfit for that

FIG. 4 —FOUNDRY NO. 2, MAHER & FLOCKHART.

purpose. The latter is raised from the well by steam pressure to a 3,000-gallon tank on the roof and is used in the foundries for clay washes, sand wetting, etc.

On bright days, during the forenoon hours, the small belted generator is capable of carrying the entire electric load, but in the afternoon when the furnaces are in operation, it is necessary to run the direct-connected set. This has a capacity of 100 kilowatts at 125 volts and a speed of 250 revolutions per minute. The set and the switchboard controlling the electric light and power distribution are shown in Fig. 2.

The other steam-driven air compressor is used to supply two sand blasts for cleaning castings, and was manufactured by the Franklin Iron Works, of Port Carbon, Pa. It is double-acting, with steam cylinder 12 inches in diameter, air cylinder 16 inches and stroke 16 inches long. It runs normally at 82 revolutions per minute and supplies about 130 cubic feet of air per minute at a pressure of 20 pounds to the square inch.

From the engine room the main line shaft extends over the boilers into the chipping and grinding room, where it drives three double emery grinders, and continuing still further, belts to two tumblers and a Root exhaust fan. The chipping room is one of several where the finished castings are cleaned and trimmed, both hand and air chisels being used. The tumblers, which were but recently installed, are 36 inches in diameter by 48 inches long, and of an enclosed pattern manufactured by the W. W. Sly Co., of Cleveland, O. Unlike the old style, which allowed the dust and dirt to sift through perforations and settle where it would, these are devoided of their dirt by an exhaust fan connecting with an enclosed elevated bin. From time to time the accumulation in the latter is dumped through a gate at the bottom into cars and removed.

In the opposite direction the engine room line shaft is extended into the furnace room off foundry No. 1, where it is belted to a freight hoist used in charging the three adjacent cupolas which serve foundries 1 and 2, and, also, to a No. 6 Buffalo blower. This is used in connection with a special process for baking large dry sand molds without the use of an oven, that is said to accomplish the work in less than half the time required in oven baking. The blower discharge is piped underground to a convenient fixed point near the center of the foundry and from this a temporary pipe connection is made to the mold to be baked. A fire is built in a rectangular sheet iron stove, placed on top of the mold, through which the air is passed just before it enters the runner. The hot air is thus delivered to all parts of the mold in the most even manner possible, and being under pressure, dries out the moisture very rapidly.

The engine room line shaft also drives a long shaft in foundry No. 1, Fig. 3, furnishing power by cross belts to three jib cranes, having capacities of 10, 15 and 20 tons, respectively. These were manufactured by the Farrel Foundry & Machine Co., of Ansonia, Ct., and are arranged in a line through the middle of the shop as close together as possible without interfering with one another. In addition there are three hand-power jib cranes of four tons capacity each, two on one side of the shop and one on the other, placed so that they will reach to the larger cranes. The shop is 192 feet long by 53 feet wide, but every part of it except the extreme corners is accessible to one or another of these six cranes. As before stated, there are two cupolas to this shop. The older one is a 56-inch Colliau furnace, melting from 5 to 7 tons per hour. It is seldom used now except in slack seasons. The new one was furnished by the Whiting Foundry Equipment Co., is 72 inches in diameter and will melt between 10 and 12 tons per hour. For the baking of dry sand molds and cores there are six ovens, the dimensions of which are interesting as showing the quantity and size of the work which may be baked at one time. All are 16 feet deep; one is 10 feet wide and 9 feet high; the rest are 8 feet high, one being 12 feet wide, two 7 feet wide, and two 8 feet wide. Each oven has an iron car running on rails which receives the charge to be baked from the cranes and is then rolled inside. A baking lasts over night, about twelve hours, the average temperature during that time being about 220 degrees F. To supply the heat a fire is built in a pit at the rear of each oven, using enough coal to last about eight hours. For the rest of the time there is very slight loss of heat until the doors are opened in the morning.

The shaft in this foundry is belted through the wall to two sand mixtures in the adjoining core and sand room. One of these is a slowly revolving screen for mixing and sifting the ingredients for the dry-sand work. The other is a Sellers horizontal centrifugal green-sand mixer and runs at about 1,000 revolutions per

minute. Another dry-sand mixer is located near shop No. 3 and is driven by a 5-horsepower Crocker-Wheeler inclosed motor.

The small casting foundry No. 2, Fig. 4, has about 7,500 square feet of floor space, exclusive of core and furnace rooms. Cranes are not needed here; instead there is an overhead track and trolley system extending around the room for conveying large ladles, from which the smaller hand ladles are filled. The cupola is a 56-inch Whiting, having a capacity of about 6 tons per hour. Much of the work

FIG. 5—FOUNDRY NO. 3, MAHER & FLOCKHART.

done in this shop consists of large quantities of castings from the same pattern, and for this several molding machines are used, each, when skillfully handled, capable of turning out from 2 to 20 molds an hour, depending on their size.

Foundry No. 3, Fig. 5, is 177½ feet long by 67½ feet wide, with a line of pillars down the center, and each half served by two 4-ton traveling cranes. One is an electric crane with Crocker-Wheeler motors. At present the other three have hand-travel and pneumatic hoists, but these are soon to be equipped with electric travel to increase the speed of handling, and electric hoists on account of the poor efficiency of air hoists and the difficulty of keeping the necessarily long lines of rubber hose in repair. Two cupolas serve this foundry, one being a 72-inch Newton, built by the Northern Engineering Works, of Detroit, Mich., and the other a 55-inch Whiting. But one is used at a time, the choice depending upon the amount of work on the floor. The blast is furnished by a Root rotary pressure blower, driven at 100 revolutions per minute by a Crocker-Wheeler 35-horsepower open-type motor, and a direct-acting pneumatic lift is used for elevating coke and iron for charging furnaces. There are three ovens similar in construction and operation to those in shop No. 1. Two are 8 feet wide by 8 feet high by 12 feet deep and the other is 10 feet wide, with the same height and depth.

Shop No. 4 is 37 feet wide by 154 feet long and contains two electric traveling cranes, one of 10 tons capacity, built by Pawling & Harnischfeger, of Milwaukee, and one of 5 tons capacity installed by the Cleveland Crane &

Car Co., and equipped with Crocker-Wheeler crane motors. Whenever any casting is done in this shop the metal is brought in a large ladle car from No. 1 foundry. The system of tracking, laid on a gauge of 40 inches, connects all parts of the works, even crossing Clover Street, as shown on the plan. The cleaning shop beside No. 4 is well fitted to handle moderate sized work rapidly. It is divided longitudinally and has two hand-power cranes of 3,000 and 6,000 pounds capacity, respectively, serving one half, and a 4,000-pound electric traveling crane, controlled from the floor, serving the other half.

A small but indispensable part of the plant is the machine shop on the other side of Clover Street. Although it is in an out-of-the-way location this disadvantage is more than compensated for by the excellent conveying facilities, already described, and the absence of dust and dirt, making it easier to keep the machine tools clean and in good shape. Alongside of the machine shop is a yard for the storage of idle flasks. To handle the heavier flasks there is a hand-operated traveling crane in the yard, which is also of service in passing machinery to be repaired to the 4-ton hand crane in the machine shop. The tools in the shop include a Pennsylvania drill press, an F. E. Reeden 10-inch lathe with a 14-foot bed, a Bickford 48-inch radial drill, a 48-inch by 20-foot planer, a 20-inch Pond lathe with a 12-foot bed, a 26-inch Prentiss back-gear crank shaper, and a Sanderson bolt and screw cutting machine taking stock up to 3 inches in diameter. Power is provided through line shafting by a 15-horsepower Crocker-Wheeler shunt-wound motor running at 1,200 revolutions per minute. Since the plant is operated strictly as a foundry and does not presume to contract for outside machine work, this shop is ample in size and equipment for its purpose, i. e., the keeping of the mechanical features in the best possible condition by providing repairs and improvements whenever they are demanded.

The Western Mfg. Co., San Francisco, Cal., has been reincorporated under the name of The Western Brass Works, at the same time increasing its capital from $25,000 to $100,000. It has new machinery and a thoroughly equipped brass works.

The Cloverport Foundry & Machine Co., of Covington, Ky., has been incorporated and will erect a new foundry building. Mr. M. L. Christian is president and J. C. Nolte, secretary.

EMERY WHEEL PRACTICE IN FOUNDRIES.*

BY CHARLES G. SMITH.

An attempt to discuss in an exhaustive manner the possibilities of emery wheel practice plunges us into a subject of enormous depth and far-reaching effect. As this practice in our industrial institutions is but in its infancy, the last few years have tended to elevate it from a necessary evil to the eminent position of one of the most modern and economical practices of the present day. Its field broadens daily, as our mechanics recognize its importance, its limitations not being confined to any one department, but its practical uses rendering it adaptable to all branches of manufacture.

This condition has been brought about mainly by the persistence of the few who have had faith enough in its success in ascertaining, at an enormous expense to themselves, the facts in the case, and forcing it into practice against much prejudice and opposition. With all new methods in shop, there is invariably considerable opposition, and many impediments are placed in the way of anything that is at variance with the customs that have been in vogue. But those who have championed emery grinding have fully succeeded, with considerable effort, in having it placed among those important places alongside the other machine tools in the shop and factory.

A few years ago in nearly every shop, and at present in a great many shops, when one is about to buy an emery grinding machine, it is his opinion that "most any" style of machine will answer the purpose; and when this machine is received, it is set any place in the shop without regard to stability. Any pulley that may be lying around the shop will be put on the line shaft, and any emery wheels had from stock in some supply house will be put on the machine. Because they look to be running fast the speed is correct. No consideration is given to the diameter of the spindle in selecting the size of the wheels that are to be used on the machine. After such careless consideration good results are expected; if they are not obtained the conclusion is reached in very many cases that satisfaction cannot be had by the use of emery wheels. But, on the contrary, if the proper care is taken in the selection of the machine, and as much care taken in setting it up, and the proper speeds and grades obtained, it is surprising to know the increase of efficiency. As the conditions

*Read before the Pittsburg Foundrymen's Association Sept. 7.

vary in most every shop, the above points should be ascertained by the party proposing to furnish the machine, as very many things are to be considered in obtaining satisfactory results.

Adaptation to Service.

There are many kinds of emery grinding, foundry grinding and machine shop grinding, and each of these can be subdivided into a number of different classes of work. In iron foundry work very little grinding can be done with economy on heavy castings, unless the iron is hard, in which case the swing frame machine with about a 20x2½-inch wheel, running at 1,200 r. p. m., will grind considerably faster than it could be chipped. The amount of gain in grinding will depend, of course, on the hardness and ductility of the iron. I have seen iron castings so hard that it took two men 1¾ hours to chip the gate and fin from one side. In such cases as this, two men could have ground this gate and fin with a swing frame machine in a very little over fifteen minutes.

But on soft iron the advantage is in favor of the chipping, as in this case the iron spawls before the chisel, and the man with one blow of the hammer can remove considerable of the gate and fin, which gives a great advantage in favor of the chipping. In a great many foundries I have noticed that the grinding on light castings has been done on light machines, using small wheels, and in almost every case the machine has been set without any regard to its stability.

Now, you will invariably be reimbursed, if in buying an emery grinding machine, you purchase a heavy stand with long bearings and large diameter of spindle; and by placing it on a concrete foundation, you will find that the machine will run a great deal smoother than if it was standing on the floor, which will enable the wheels to run smoothly and cause them to become out of true a great deal less than were they set so that there may be vibration in the spindle. This will cause considerably less dressing of the wheel, and, as it is always necessary to dress the wheel to the lower point when it has become out of true, you will receive more than reasonable interest on your investment, in the foundation, in the amount of emery that you save in truing your wheel.

Then it is often the case that wheels too small have been used to accomplish satisfactory results. The largest diameter wheel practical should always be used for doing any kind of grinding. For instance, a wheel 24 in. in diameter will do more work per dollar invested down to 18 in. in diameter than an 18-in. wheel will do. Another point to be regarded is the belt power furnished to drive the wheel. It is very necessary that there is belt capacity enough on the machine to keep the wheels up to speed while they are under duty, as the speed of a wheel when running idle will have no effect on the work, if it is not kept up to this speed when it is doing the work.

Neglect in the above mentioned points has caused many to abandon the practice of grinding their castings with emery wheels.

Examples of Foundry Grinding.

For grinding any castings in a foundry where the man can lift the casting up to the machine, it will be found that the most economical and satisfactory results can be obtained by having a heavy machine with a 24x3-in. wheel driven with a 5-in. belt, wheels speeded at 1,000 r. p. m. This will give you wheels heavy enough to resist pressure of the work that will be forced to the wheel, and the power that is in the belt will force the wheels to cut instead of shrinking from duty and becoming out of true, which invariably happens where the belt power is insufficient, and the man pressing at uneven pressure will bring the wheel to slacken its speed at intervals.

In steel foundry practice, the emery wheel has been found to be quite a success, and it is as far ahead of any other method that is commonly in use to a large scale on both heavy and light work, as is the same in malleable iron foundries.

I have seen a gate ground with an emery wheel, on a swing frame grinder, by two men in less than fifteen minutes. This same gate would have required about two and a half hours to plane or shape from the casting, so that you will see that the saving is enormous in this instance over and above the machine work, and as compared with chipping by hand where two men are required, it will make a great deal better showing than above stated.

Within the last few years large grindstones have been and are being displaced by the emery wheel to a very great extent, and I believe that within a reasonable time the grindstone will be a relic. This change has been attended with many difficulties, as prejudice on the part of the consumer has placed many an unnecessary obstacle in the path of success, but the advantage was so strongly in favor of the emery wheel that every obstacle is being

surmounted, and for many purposes many firms have discarded their grindstones, and have found it economy to equip with new emery wheel machinery entire.

For instance, in grinding plows, which has always been done on grindstones, this has undergone an entire reformation of practice. Nearly all plows, no matter how they are made, whether tempered or chilled, are now ground on emery wheels.

At first the manufacturers of the plows claimed that this could never be accomplished, and raised one objection after another, first stating that the temper would be drawn, next stating that the man could not earn a day's wages. Next they would state that the emery wheel would not last long enough to overcome the difference in the cost between the grindstone and the emery wheel. One by one all these were overcome, until at present the men are making more money per day than they were on the grindstone, the practice is a great deal cleaner, as they do not have to work in a sloppy shop, as they were compelled to with the grindstone, and the cost of the emery wheels as compared with that of the grindstone has given considerable of a saving to the manufacturers. In some instances they are saving enough to justify their throwing out the old equipment and installing an entire new plant and building new buildings for doing this kind of work.

Some Machine Shop Examples.

In machine shops the development of uses for emery wheels has been remarkable, and there is today an immense amount of work done with the emery wheel in the machine shop that a few years ago was not considered as practical. In a shop in western Pennsylvania, a recent test was made where a shaft which had 1-64 in. all around to be removed was placed in an emery grinding machine. At the same time a duplicate of this shaft was placed in a lathe. The grinding machine finished the shaft in a little over 37 minutes, leaving it in better condition than the lathe, on which it took two hours and eight minutes to finish. Another test on an emery surface grinder with a wheel 12x2 in., medium hard and very coarse, on cast iron, showed most excellent results with a cut ¼ in. deep, ⅛ in. cross feed and 35 ft. table feed per minute. This seems almost incredible.

The most recent development in design of emery grinding machines is a surface grinder with a circular table, similar to a boring mill, the wheel about 16x2 in. and to be automatically fed into the center and out to the edge. The machine is so substantially built that for heavy cuts and accurate work it is well adapted to grind valves of steam pumps, air compressors, etc., to leave them perfectly tight. This will tend to show that the emery grinding manufacturers are determined to invade all branches of machine shop practice.

There is also another machine being designed at present, for grinding very heavy shafts, that is intended not only to finish the work, but where shafts can be cast or forged reasonably close to size, the emery grinder will remove the stock and also finish the work without having to put it on a lathe for the roughing cut.

Points to be Considered.

In obtaining results in emery grinding, several things must be considered: 1. The required condition of the work when finished, whether it is to be polished when taken from the machine, or polished by buffing afterwards. In the latter case the number of emery that is used in the buffing must be considered. It is to be considered also if the material to be ground is tempered or not, before or after grinding. 2. How much stock is to be removed. 3. What is the nature of the material to be ground—cast steel, machinery steel, chilled iron, cast iron, brass, malleable, and is it hard or soft? 4. Are the pieces light or heavy? How much metal is there in the part to be ground, to absorb the heat? All these things must be considered to ascertain the proper method of performing the work and the grain and grade of wheel to do it correctly.

In regard to grain and grade of wheels, I would say the best results are always obtained by using as coarse a wheel as possible and hard as possible, as a coarse, hard wheel will not fill with metal so easily, and being hard will not scratch so deeply.

In a recent test that I made where the steel was hard and to be tempered and very highly polished, we produced much finer work on a wheel 6x8 in., made of No. 16 emery and hard, than on one of No. 46 material, and softer. The latter made deeper scratches that could not be polished out, and the former left the work in excellent condition. When polished it was in as perfect condition as after having been ground on a grindstone.

Better results will also be obtained by using wheels of large diameter—the larger the diameter of the wheel the better the results. I have

had parties complain to me in shops and foundries that they were not able to get any results from grinding their work, and upon examining the conditions found that they had a small machine, carrying a 14-in. or 16-in. wheel about 2-in. face, the machine merely bolted to the floor with considerable vibration in it. I induced these same parties to install a substantial machine and use a 24x3-in. or 4-in. wheel, running it at 1,000 r. p. m., having the machine on a concrete foundation, and they were astonished at the difference in the results.

For heavy steel castings, chilled iron or hard iron castings, excellent results may be obtained by the use of a swing frame grinding machine with an elbow joint, operating with a man on each side of the wheel. I have seen a steel gate on a heavy steel casting 5½ in. in diameter, ⅝ in. high, ground entirely away in 13½ minutes with one of these swing grinding machines, with two men operating the machine.

Another point of considerable importance is the speed at which the emery wheel runs. You should be just as particular in getting the proper speed at which to run an emery wheel as you are in procuring information to start a planer or a lathe or any other machine that you are setting in your shop. Were you to buy a planing machine and ask the manufacturer for the speed, which he would advise you to be 375 r. p. m., you would not run it at 250 r. p. m. or 500 r. p. m. On an emery wheel a few revolutions per minute may mean a great deal in results.

In a test made to ascertain some facts on this point, a machine was rigged so as to give a uniform pressure against the wheel. A piece of steel was cut exactly in half and the wheel speeded at 5,000 ft. peripheral speed per minute, and one of these pieces of steel was ground on the wheel under those conditions. Then the wheel was speeded to 6,500 ft. peripheral speed per minute, and under the same pressure the other piece of this steel was ground. It was learned that about 2¾ times the metal per cubic inch of emery was ground at 6,500 ft. per minute that was ground at 5,000 feet per minute, and this same amount of grinding was performed in three-fourths of the time required at 5,000 feet per minute.

The new foundry of the Standard Engineering Co., at Ellwood City, Pa., is almost completed. A 50-ton Niles crane is already in place.

DRYING MOLDS.

BY HENRY HESS.

We are all—some of us to our sorrow—familiar with the usual methods employed in drying molds. Who has not seen molder and helper hunting high and low throughout the foundry, exploring all the recesses of the flask-yard and the neighboring dump grounds for pieces of old roofing tin to bend up into the semblance of pan or box to hold a charcoal fire? This is not a picture for which the imagination has been drawn on nor yet the practice of some backwoods foundry, but the, not by any means exaggerated, condition of affairs in more than one works of national reputation.

The best current arrangements are not so far removed from this crude way as to deny their kinship at first glance—the haphazard sheets and pans of roofing tin are replaced by cast-iron crates and baskets for coke or charcoal suspended as their sizes and the available mold space will permit, with an occasional attempt at confining the heat by covering the mold with sheet metal.

Quite a number of years ago there came an engineer from Germany to introduce here a method in use in the Fatherland that consisted in the blowing of heated air through the molds; to the extent of having his methods tried in at least one shop of prominence, and with fair results he was successful. Exaggerated ideas of the financial value of the method and the imposition of conditions that, to the intending purchaser, at any rate, seemed prohibitory, aided a very conservative foundry foreman in securing its rejection. So far as I am aware the method has not since acquired a footing in the United States.

While occupied with the erection of a large foundry in Germany the patentee of a similar method and apparatus offered his for adoption. Broadly, it consisted of the location at a convenient central point of a coke stove, of a blower for forcing air through the glowing cokebed, of a network of distributing piping with frequent outlets and of jointed or flexible pipes for conveying the heated air from these outlets to the molds to be dried. As the arrangement was in successful use not only in the patentee's own not inconsiderable foundry, but many others as well, to the satisfaction of all concerned, it certainly merited serious consideration, the more so as it promised to do away entirely with the nuisance of

having to adapt all sorts of, at the best makeshift, baskets and pans to the constantly varying requirements of the molder. The proven contention that this method also resulted in a far more uniform drying, reaching even remote corners and pockets, as well as a saving of time and fuel, was decisive.

The foundry in consideration had the general arrangement shown in plan by Fig. 1; there were three parallel aisles of 50x200 feet, each with supporting pillars for the craneways every 16 feet. The patentee proposed the carriage of two main lines through the crane columns, each fed with heated air from its own stove, as shown. Short vertical spurs were to descend on each column, each terminating in a Y, each leg of which was to be fitted with a throttle, the whole closely following the arrangement of the familiar Buffalo or Sturtevant heating systems. The patentee also favored taking the air from the Y to the mold by a series of jointed pipes, with flexible armored hose as a handier though costly and not very durable alternative. The heating stoves and the jointed pipe were to be furnished by the patentee, leaving the distributing pipe and the blowers to be found by the user. It soon developed that the cost of the making and installation of the distributing pipe was so much the larger item as to seem entirely out of proportion. It occurred to the writer that a small stove, a small blower and a small electric motor to drive the blower, combined as a unit set, would answer every purpose, provided a sufficient number of such sets were

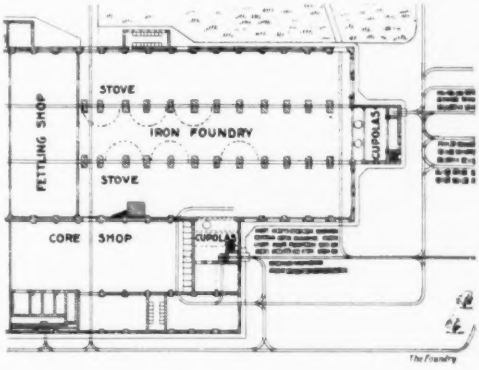


FIG. 1.—DRYING MOLDS.

on hand. Fig. 2 shows the combination. The stove is the smallest regular size made by the patentee, the blower is one of the Buffalo Forge Co.'s smaller numbers, the direct current motor is a standard one horsepower machine. These three elements are mounted on a common baseplate and the motor housed in to protect it against the foundry dirt and dust

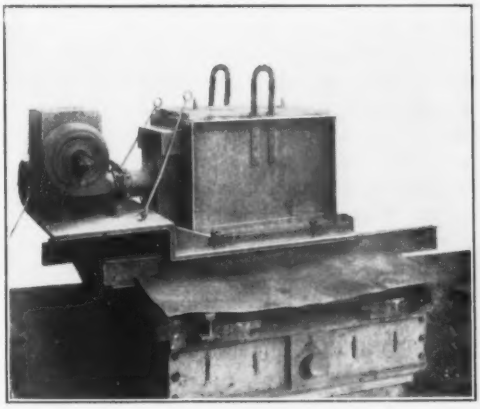


FIG. 2.—DRYING MOLDS.

and also to safeguard the men. As every alternate cranecolumn was provided with a plug switch for the detachable jibcranes used, a sufficient length of armored cable with a plug end was rolled up on a drum attached to the motor frame. Made up in this way from units designed without any reference to one another the resultant combination was not exactly an "object of beauty," but certainly a "joy forever" to the molder and his helper.

The cost of a sufficient number, if my memory serves me correctly, six large and five small stoves, to adequately serve the foundry, was less, by a very fair margin, than that of the distributing pipes first proposed. Certainly the flexibility of the arrangement was much greater, while the light cable for carrying current interfered far less than the cumbersome and very vulnerable jointed pipes would have done.

The ears of the furnace and the eyebars resting against it were employed in transportation by the overhead cranes. The stove was rather a crude affair, a mere sheet and angle iron box lined with firebrick, supplied with a grate, an air inlet and gate at one end and an air outlet from the bottom; this outlet is not visible in the illustration as it is concealed by the mold being dried. Coke was fed through the removable firebrick top. Occasionally, for very large or long molds, two of these stoves were used on one mold. By suitably covering and providing outlets at places beyond corners and pockets difficult of access to the air

current uniform drying of the entire mold could be secured.

Were I called upon to instal another plant I should adopt the same general arrangement, but modify the construction of the stove to secure a heating of the air without bringing it into direct contact with the fire. With the stoves used, in which the air was forced through the fire, more or less ash and cinder was carried into the mold; it was therefore not practicable to skindry greensand cores in place, as getting the ashes out was too slow a job. With only clean, hot air blown into the mold the arrangement approaches about as near to the ideal as the little spoilt foundryman has hopes of getting.

THE FOUNDRY FOREMEN'S ASSOCIATION.

BY CHARLES H. THOMAS, PRESIDENT.

In May, 1901, was ushered into existence at Detroit an organization known as the Associated Foundry Foremen. To-day it has a membership of 150 and is steadily growing, securing for its members some of the best foundry foremen in the country. The average foundryman or foreman does not seem to understand the necessity or desirability of belonging to such an organization. This is the age of progress and only progressive men will succeed in it. This is also an age of united effort, and the old idea of individualism and trade secrets is fast passing away. Only the men who take advantage of not only their successes and failures, but those of others, are going to be successful. The employers who are members of the American Foundrymen's Association mostly realize the worth of such an organization as the Associated Foundry Foremen, and have encouraged their men to join it, recognizing the fact that if their foremen are to get out their work in a modern up-to-date manner, it will be necessary for them to brush up against other bright, live men in the business, and keep in touch with what is being done in other foundries. The Associated Foundry Foremen is not only of advantage on account of its national meetings and the discussions that take place at that time, but on account of the privilege the members have of corresponding with the secretary concerning difficulties which arise in their everyday work. Every foreman knows how he occasionally meets with a difficulty concerning which he would be very glad to obtain a little information. In many cases this information would save costly experiments. Such experiments can often be avoided by writing the secretary who can give the desired information or give the address of a man who can give it. The most successful foundry foremen are always trying to reduce the cost of production, not by forcing the men to an abnormal rate of work, but by planning the work and arranging the rigging in such a way as to enable the men to turn out a larger tonnage with no increase in the manual effort. No one man can continue eternally to evolve new plans from his head without some external help. When bright men band themselves together to assist each other in these lines they are very much benefited and this is the prime object of any such organization. Membership in the society is $2.00 per year and this is exceedingly cheap when it is considered that one has the privilege of consulting many of the brightest minds in the country. The officers of the association are: Charles H. Thomas, president; Edward B. Gilmour, vice president; James A. Murphy, secretary and treasurer. The secretary's address is: 1616 Sassafras St., Erie, Pa.

CAR WHEEL CONSOLIDATION.

The National Car Wheel Co., of Rochester, N. Y., a consolidation of seven of the largest car wheel plants in the East and Central West, has been incorporated with a capital stock of $9,000,000 at Albany, N. Y. The directors of the company are Frank D. Russell and Charles P. Chapin, of Rochester; Charles A. Maher, of Cleveland; Charles V. Slocum, of Pittsburg; William T. Goodnow, of Sayre, Pa.; James R. Burnett, Howard C. Smith, Forsyth Wicks and Beverly R. Robinson, of New York. The following plants are included in the consolidation: Rochester Car Wheel Co., Rochester, N. Y.; Maher Car Wheel Co., Cleveland, O.; Cayuta Wheel Co., Sayre, Pa.; Keystone Car Wheel Co., Pittsburg; Ramapo Car Wheel Co., Ramapo, N. Y.; Maryland Car Wheel Co., Baltimore, Md.; and the New York Car Wheel Works, Buffalo, N. Y.

Flum Brothers have recently completed the erection of a new foundry plant at Hamilton, O., the principal product of which will be gray iron castings. The main molding floor is 60x108 feet, with a two-story structure on High street 48x60 feet. The new plant ran off its first heat Aug. 1 and is now employing some 30 molders. The Flum Brothers were formerly identified with the Vulcan Foundry Co., of Hamilton.

CAST IRON NOTES.

Devoted to inquiries from Practical Foundrymen on the subject of Melting and Using Cast Iron. Address all inquiries to W. J. KEEP, care of The Foundry.

Slagging and Fluxing a Cupola.

Question.—Do you think that letting the slag blow out of a cupola will put the cleaner iron in the ladle than it would by not slagging it? Does fluxing a cupola with limestone help to clean it?

Answer.—It would seem from the question that the slag was allowed to blow out of the taphole. This should never be done. If the iron is drawn out as fast as melted the taphole should be just large enough to be kept full of iron without any slag escaping. If slag appears the hole should be closed until there is enough iron to hold back the slag. If slag is drawn off at all it should be done through a separate slag hole. The slag should be allowed to form a hood over this hole and the spout so that the melted slag will run continuously under such a crust and not blow out and sputter. The blast should be held in the cupola. If a large quantity of iron is to be melted at one heat in one cupola and the slag would reach above the tuyeres, if it is not drawn off the slag chilled by the blast would soon clog the cupola and check the melting The object of slagging is to permit of long heats.

The melted iron in the hearth of a cupola should always be covered with melted slag to protect it from the action of the blast and to strain the dirt out of the melted iron as it drops through it. The slag hole is therefore located about 4 inches below the tuyeres and 8 inches or more above the sand bottom, if melting with coke. A cupola with much less distance above the bottom cannot be slagged successfully. If the slag in such cupolas is blown out of the taphole it not only leaves the surface of the melted iron exposed to the blast, but all dirt runs out with the iron and much slag and dirt will run into the ladle and cause trouble.

Flux is used to make the slag fluid enough to run out of the slag hole and to make a clean drop of the bottom. A fluid slag makes cleaner iron than a thick slag. Hot fluid iron and slag will make clean iron.

Melting Ratio and Mixture.

The founder whose question was answered under this title in Cast Iron Notes for September thinks the answer somewhat vague. He says that on further examination he finds that his iron is hot until about the third or fourth charge, when it gets dull.

He thinks because he cannot get as good results as the answer stated that his cupola construction must be wrong, but, as from his letter, I find that it is of one of the best makes, the only change that I would wish would be to use only one row of tuyeres so as to concentrate the blast lower down.

He thinks his coke too soft, but it will be hard to get better. Fine broken coke will never give good results used alone and should be distributed among reasonably coarse coke.

If the iron is hot I would not care so much about the ratio of iron and coke, but if the charges are varied a very little at a time, as suggested, a better ratio will be obtained.

He asks if his tuyere area, 280 square inches, is sufficient. I would prefer 16 tuyeres 7 inches wide and only 4 inches high on the inside = 348 square inches, but there are plenty of cupolas with less area doing good work.

I would also use a good water gauge for the blast and would want from 14 to 18 inches. This would be considered high by most founders. Twenty-four inches is about the right height for the coke bed above the tuyeres.

White Iron Caused by Sulphurous Coke.

I have a letter which reads as follows: "We got some sulphurous coke—so bad that it fairly choked the hands off the scaffold—and the first few hundred pounds of iron from the taphole, being unfit for use, was pigged. Next day the pigs were broken and showed white clear through a section of six inches. All castings were very hard throughout the whole heat. The heavier castings were gray in fracture, but so hard as to make it almost impossible to tool."

This will interest another correspondent, who makes very thin castings with coke containing 1.25 percent sulphur and complains of hard castings. It is strange that such coke will some days make softer castings than on others, but, with conditions that seem exactly the same, most of the sulphur will be absorbed by the iron one day and perhaps very little next day.

Scrap from such heats, if melted alone with such coke, will invariably be hard. Those making thin castings cannot use sulphurous coke.

Tieterman & Bagley, Tacoma, Wash., will erect a foundry building, 40 x 24 x 10 feet.

GENERAL VIEW OF MASSILLON IRON AND STEEL CO.

Pipe Foundry of the Massillon Iron & Steel Company, Massillon, O.

One of the earliest branches of the foundry trade to become specialized, is that of pipe founding. The men who mold and make the pipe and castings which carry water and gas to the majority of homes in every city of any extent, have for years not been looked upon as skilled mechanics but as a special class of laborers, whose main qualifications consisted in plenty of horsepower. The facts are, that a man to be a good pipe foundryman, must possess experience and skill. The pipe founders have shown what is possible in the casting of metals where one class of work can be found in sufficient volume and there is a distinct tendency in other lines to divert the molder from the more laborious forms of his calling, and to turn them over to handy men, who in time become as efficient as the best of mechanics in other lines, even if they do not know a whole lot of things about the trade which they would never have a chance to practice.

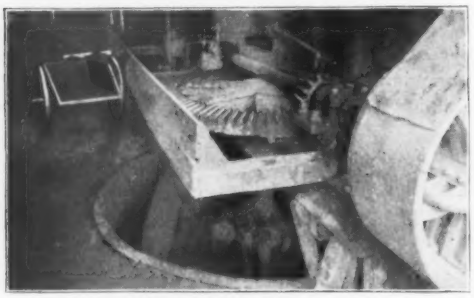
The making of case iron water or gas pipe necessarily means the handling of a very heavy tonnage of material, and were it not for the quick acting and powerful cranes of today, the output of the foundry would not be one-half what it is. Every part of a modern pipe shop must move in unison, and there can be no interruption or delay at any one point without retarding other departments of the works.

The principal pipe foundries in the United States are located where the raw materials may be assembled with the least expense, and where shipping facilities for the distribution of the finished product give a ready outlet to points of consumers. The Birmingham district of Alabama is one of the largest centers, based on its tonnage of pipe castings, on account of the Southern iron fields offering excellent inducements for this industry. The territory within fifty miles of Philadelphia in Pennsylvania is another large center. Other foundries are located in Ohio and Virginia.

INTERIOR OF PIPE MILL.

The Massillon Iron & Steel Co., of Massillon, Ohio, was organized a little over three years ago by H. A. Croxton. His associates

were men who had been favored with a large experience in pipe founding, making pig iron, and manufacturing, and in erecting their new plant advantage was taken of every improvement that would tend to facilitate the man-



MUD MILLS OR GRINDING PANS.

ufacture of a large tonnage of good pipe at the minimum cost. The works were so planned that from the time the raw material is unloaded on the north side of the foundry until it is loaded upon cars at the depressed siding on the south side of the foundry everything moves in one continual direction. The plant is so located that gravity supplies an easy means for handling the castings after they leave the foundry; every one-hundred feet of distance having a fall of one foot, doing away with the necessity for mechanical equipment, to handle product. As the outbound siding, where the pipe are loaded, comes below the level of the ground, all cars may be readily loaded by simply rolling the pipe into the cars.

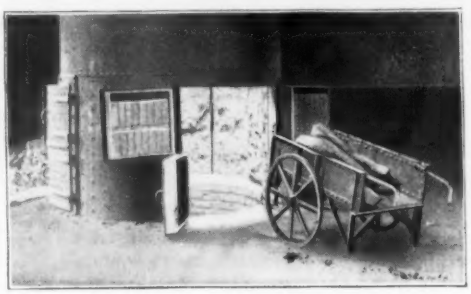
It will be noted from the illustrations that all coke and pig iron is unloaded on a level with the charging floor of the cupolas. Two of these, 102 inch inside diameter, are employed on alternate days. These furnaces have a capacity of 25 tons of melted iron per hour, each. They are provided with three sets of charging doors each, the bottom of which is level with the floor. The charging barrows may therefore be wheeled right to the doors and their contents emptied into the cupolas, and only enough iron or coke needs to be handled to level up the charges. The natural surroundings have lent themselves admirably to the general plan upon which the works are laid out, a sloping hillside forming a solid foundation for the side track, leading to the stock yards.

The molding and core sand, in fact any material needed in the foundry, can thus be delivered at an elevation from where it is to be used. The loam for making cores is taken out of a hillside, run by gravity to bins in the second story of the building in which are located the grinding pans for preparing it ready for use, whence it is conveyed through shutes into the pans. After being ground it is carried from the bottom of the pan down into cars and conveyed to the coremakers. In a pipe foundry, the coremakers, with their ovens, take up about the same amount of room as the moulders, and are, if anything, of more importance.

The works of the Massillon Iron & Steel Co., are run exclusively with electric power, and to the average foundryman it is a revelation to observe the dexterity and speed with which even a large core is carried to the oven.

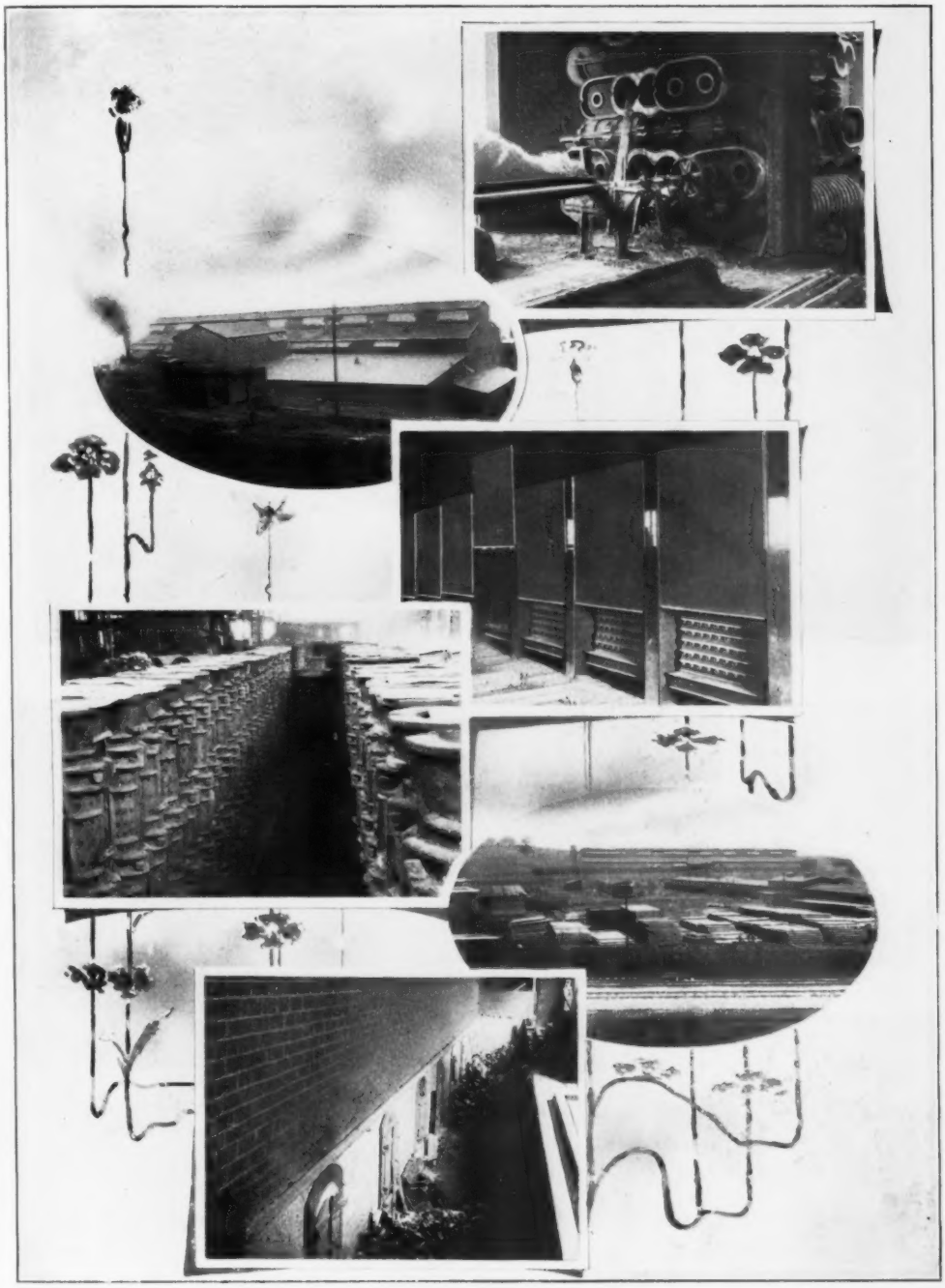
Many attempts have been made to produce pipe cores without the use of hay-rope, yet this material has never been successfully replaced. Its comparative cheapness in the United States has rendered it extremely difficult to find something more economical or a method which will really make better or cheaper cores.

The "Fletcher" process, described in these columns several years ago, which involved the use of a coating of sawdust made into a paste with the aid of a weak solution of hydrated starch, for a time made some claim to recognition which the passing years have failed to substantiate. Collapsible core barrels have been designed for the specific purpose of doing away with hay-rope in the making of cores, though none seem to have survived a mere trial. The high original cost of such



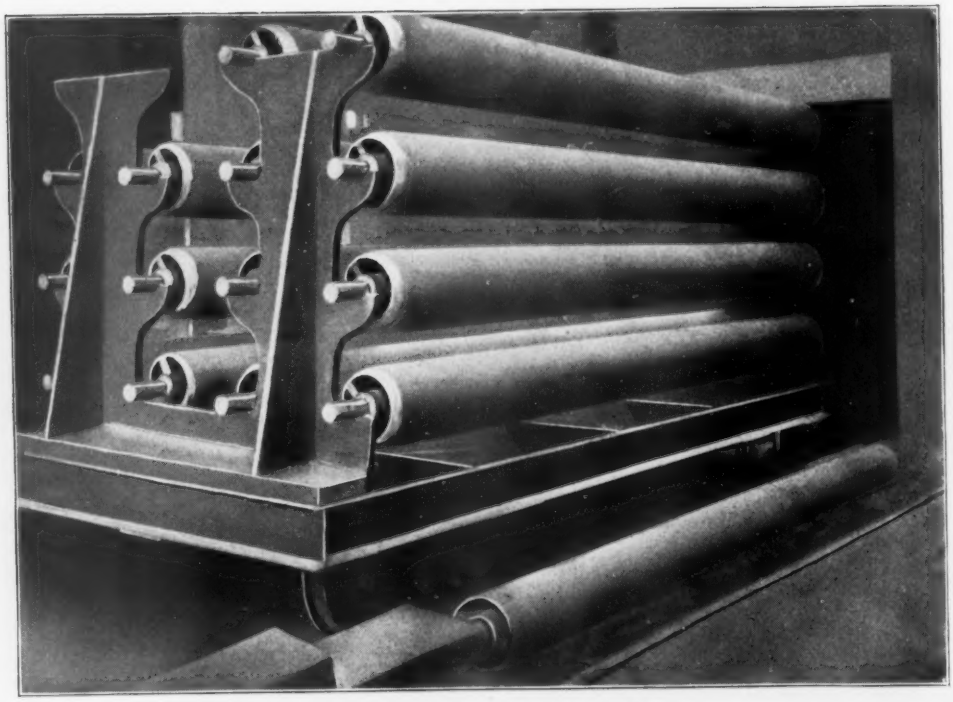
CUPOLA CHARGING DOOR AND BARROW.

appliances, together with the expense of repair bills, is probably responsible for the general sentiment that hay-rope is the cheapest in the end.

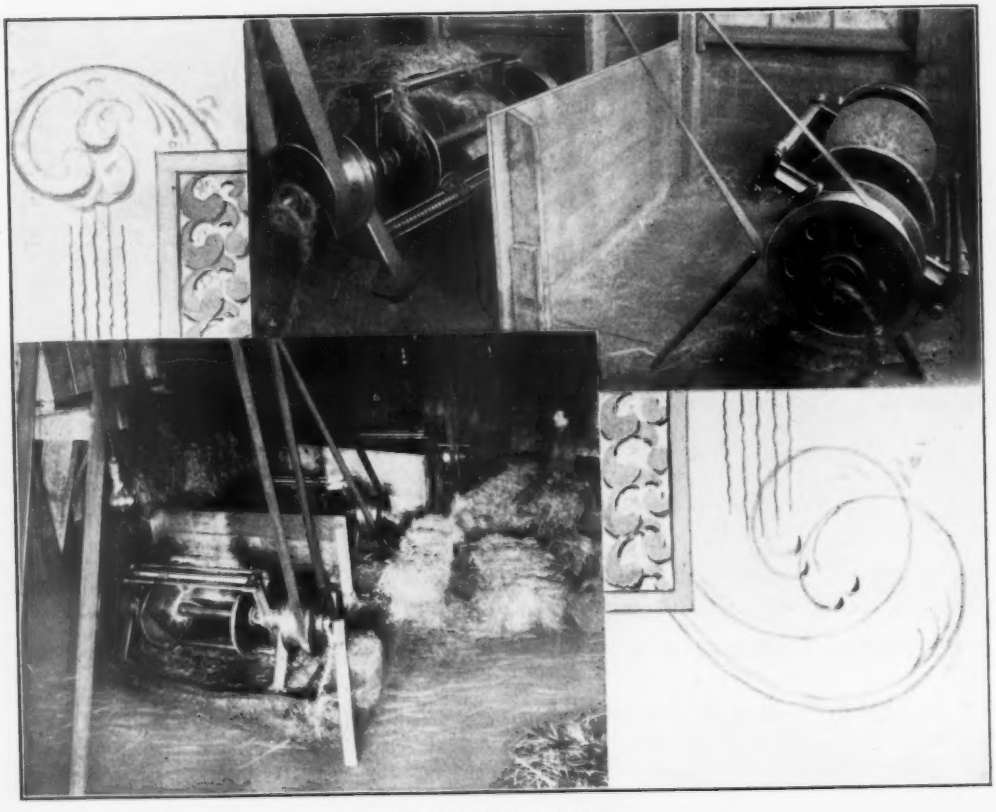


1. CORE MACHINE. 2. STOCK YARDS. 3 CORE OVEN DOOR. 4. PIPE CASTING PIT. 5. PIPE YARD. 6. FIRE HOLES FOR CORE OVENS.

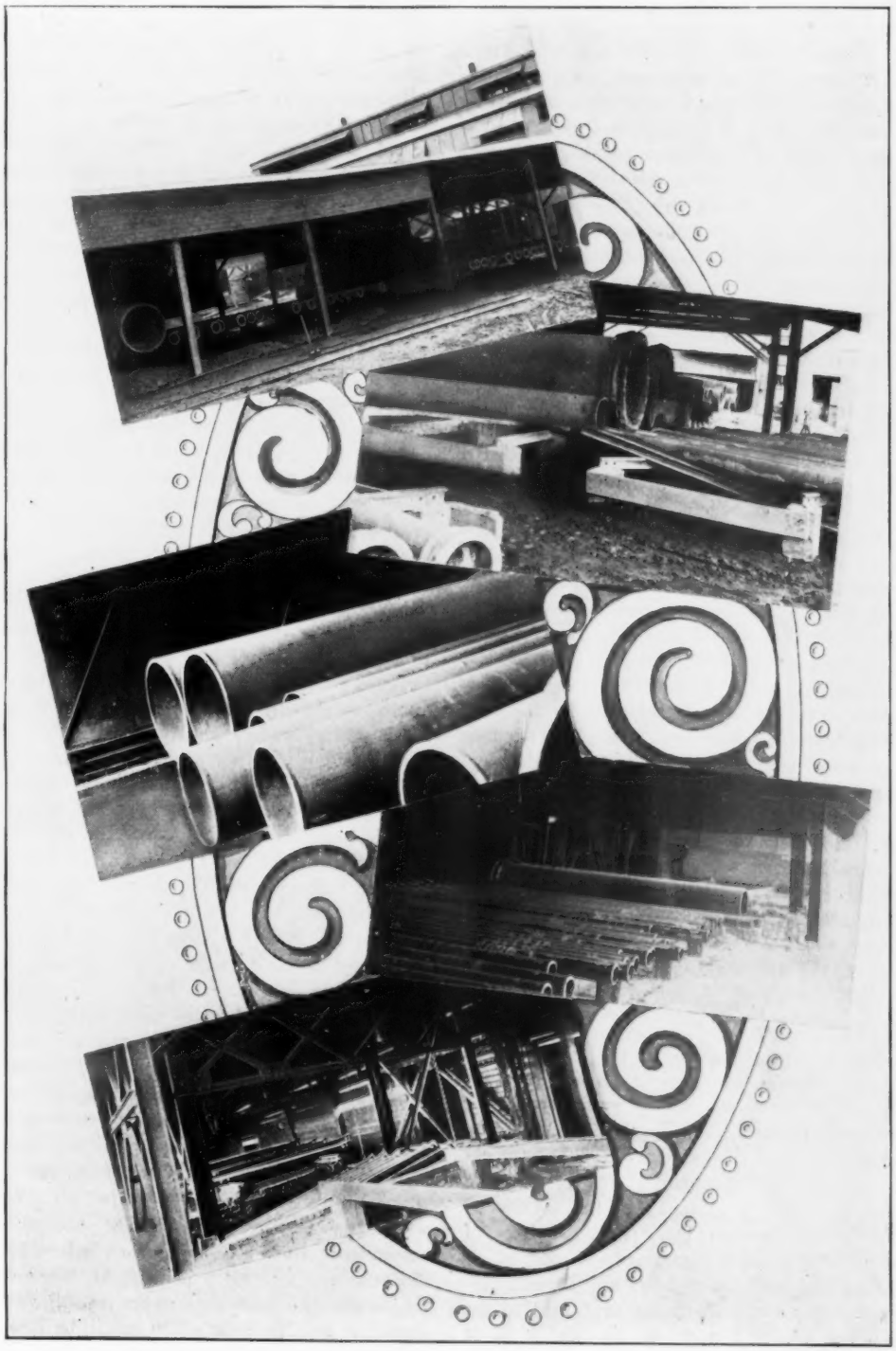
A pipe mold is rammed up on a seat which is permanently attached to one-half the flask and exactly fitting the conical taper of the pattern. As soon as the ramming of the mold is completed and the pattern withdrawn the mold is coated by pouring a bucket of pipe blacking through its interior, the surplus finding its way to a storage tank, from which



ARRANGEMENT OF CORES ON CORE CARS.



HAY ROPE SPINNING MACHINES.



CLEANING AND TESTING SHEDS.

it is removed at the end of the day's work. The completed mold is then lifted to the position shown in the illustrations, and when dry the core is placed in position and made ready for casting. After being cast, the pipe is allowed to stand but a short time before the crane is hooked on to the core barrel, and the latter removed. As soon as this is cooled sufficiently the flask is lifted to a point in the immediate vicinity where the ramming up of the molds is done, the casting is removed, the flask clamped together again and the sand made ready for use on the following day. The pipe now starts on its journey through the cleaning shed, having whatever sand adheres to its surface removed en route, together with pouring gates, and fins. If defective it goes into the scrap car to find its way back to the charging platform, and if perfect it proceeds to the heating oven from which it emerges at a heat of 300° to be immersed in a bath of coal tar. After being dipped, the pipes are slightly tilted to permit being drained, and they proceed to the scales where they are weighed and marked. The pipe lastly reaches the testing machine where it is submitted to a hydraulic pressure of 300 pounds; this pressure is much greater than is ordinarily used, and if passing this test satisfactorily, the pipe is ready to be loaded and shipped.

The above plant, cranes, and special machinery were designed and built under the personal supervision of Mr. Croxton, president and treasurer of the concern, whose experience and knowledge of other pipe foundries in the United States was used to the best advantage. No expense has been spared to make the plant mechanically correct.

COST OF DEFECTIVE CASTINGS.

BY FRED MORS BEDELL.

The superintendent of an old established concern once remarked to me: "In case a molder should lose a piece he has to stand it, as our men are all on piece work; the company, therefore, does not lose a cent." The question is, was this statement true? Is it not a fact that the company's loss is as great and at times greater than the molder's? Nearly all founders know that the item of manufacturing expense exceeds in most shops the amount paid the molders and in many instances exceeds both the amount paid to the molders and the cost of the pig iron. I would call attention to the real loss when a casting is discounted; for example, suppose that a foundry produces 300 tons of castings per month and that 20 percent or 60 tons are discounted to the molders. As we cannot expect to produce castings without some loss, we will allow 7 percent of the total as a fair percentage of discounted castings. This leaves an excess of 13 percent or 39 tons per month in the case taken. If the average selling price is $60 per ton f. o. b. cars and the molders are paid by the piece, the loss would be the difference between the selling price of the castings and the cost of iron per ton plus the expense of molding, cartage and any other piece work that may be done on the castings, such as cleaning, etc.

We will base our estimate on the assumption that iron costs $16 per ton net, the molding, $12 per ton, and cartage, 50 cents. This would leave a net loss of $60—($12+$16+.50) =$31.50 per ton or 39 times $31.50=$1,228.50 per month. If the men were paid by the day instead of by the piece this would be increased by 39 times $12=$468 per month.

The above loss does not, however, cover all losses sustained. We must take into consideration the increased cost of manufacturing per ton owing to the reduction in the tonnage produced, the loss of iron in melting, and the expense of handling the spoiled work. It is almost as expensive to handle a given number of tons of spoiled castings in the cleaning department as it is to handle the same amount of good work. The most important fact is that the regular running expense per ton of castings is increased on account of the fact that the fixed charges have to be divided by a smaller tonnage. While all may not agree that the last statement is applicable when business is dull and a large force of men can be put on to keep up the output, no one can deny that its full force is felt when foundries enjoy seasons of continued prosperity.

No gray iron foundry when managed properly should exceed 7 percent of discounted castings nor should a malleable shop go over 15 percent. A gray iron foundry running on heavy work should not exceed 5 percent. It is true, however, that there are foundries in which the loss exceeds 15 to 20 percent. The writer has managed shops making stove plate, heater work and light bench work with a loss that did not exceed 5 percent of the castings made. The above statement is taken from carefully kept records which are still in existence.

In order to locate the cause of defective

castings the manager should follow closely his individual production records and he will soon learn that a few of his molders produce the most of his bad work. When the parties responsible for the bad castings have been found, they should be weeded out if they cannot be reformed. Docking a man is not the cure, neither is the offering of a cash prize. The cause of the bad work must be removed whether it is the carelessness of the molder, the cutting and wetting of the sand by the night men, the condition of the flasks, bottom boards or patterns, the method of gating or pouring, the iron used, the cores, the lack of venting or the method of ramming. Some one should be appointed to inspect the discounted work and explain the cause of the failure to the molder. If the foreman has not time it will pay to select a good careful man to act as inspector and to have him run down the cause for the various losses. In a shop making castings it is a good plan to have the inspection department deposit on each molder's floor the bad work charged to him during the previous day. If the castings are too large to do this, a large blackboard may be used and the names of the men written upon it with the number of bad pieces and their weight placed opposite. This will help the molders to keep account of their work and will show who is making defective castings. The average molder will dislike to have a large discount continually placed against him, especially in the presence of his fellow workmen, and in order to avoid this many men will take great pains to overcome the difficulty. No foreman must expect to overcome the difficulty at once, but by following out each clue carefully and studying each man's work it will be possible to locate the trouble in time. In this as in all things "eternal vigilance is the only price of liberty."

H. W. Spaulding and A. A. Koch, of Montezuma, Ia., will open a general machine shop and foundry at Grinnell, Ia. A stock company with $10,000 capital has been organized to erect a building 60x100 feet, two stories.

The Lamb Manufacturing Co., of South Sioux City, Neb., is looking for a new location. The company manufactures sad irons and does a general foundry business. It has a capital of $150,000. W. W. Lamb is president.

Plans are being considered for the building of a foundry to cost $65,000 for the Navy Yard at Boston.

BLAST FURNACE CONDITIONS AND THE COMPOSITION OF FOUNDRY IRON.*

BY W. WALLEY DAVIS.

So much has been written about the phenomena of the blast furnace, and the investigations of the reactions taking place in it have developed so many data of positive knowledge that it seems superfluous to attempt to touch upon it further, except to record results of a special investigation. It is not the purpose of this paper to attempt to set forth anything novel or original, but to define as clearly and simply as possible some of the usual blast furnace conditions that contribute to or directly cause changes in the chemical composition of the product. As greater attention is now being paid to the chemical analysis of foundry irons by the consumers thereof, it is important that the latter should have an understanding of some of the difficulties surrounding the manfacture of pig iron, and more particularly the difficulties of producing an iron of uniform analysis.

The elements of an operating blast furnace are for the most part variables, all of them influencing its workings and the character of the iron produced. While it is possible to manipulate these variables so that a fair uniformity of results is obtained, there are certain combinations that occur frequently which compel a departure from uniformity, and make impossible an immediate return thereto. The chemical reactions that take place are progressive and continuous, and any condition that occurs to interrupt or modify the progression materially affects the ultimate result. If we consider for a moment the changes that take place in the conversion of ore into pig iron, we would the more readily appreciate the delicacy of the process and the ease with which the latter may be modified. The materials ordinarily charged into a furnace are coke, ore and limestone in the order named. While these at first assume distinct strata they do not descend into the furnace in this manner, but gradually distribute themselves in various forms according to the manner of charging. The iron ore at first suffers no chemical change, but it gradually absorbs heat until it begins to part with some of its oxygen, which immediately reacts with the carbon monoxide of the ascending gases to form dioxide. The carbon monoxide of the ascending gases next

*Paper read at the Milwaukee meeting of the American Foundrymen's Association.

doubly reacts on the iron oxide of the iron, producing carbon dioxide and a lower oxide of iron on the one hand, and carbon dioxide, metallic iron and free carbon on the other. The first of these reactions continues until the reduction is complete. The free carbon liberated and deposited reacts also on the original oxide to form metallic iron and carbon monoxide, but this metallic iron reacts with carbon dioxide to form ferrous oxide and carbon monoxide. The last reactions taking place are the conversion of the iron oxides into metallic iron by the action of carbon and carbon monoxide, and the decomposition of the limestone into lime and carbonic acid. All these reactions depend upon temperature and the composition of the gases. While the interchange of the elements occasions many complexities, there is a certain elasticity about the process that makes possible considerable variations without disastrous results. Considered simply, the reduction of iron oxide to metallic iron is effected by carbon and carbon monoxide. The air of the blast furnishes the oxygen which is converted into carbon dioxide and almost immediately into carbon monoxide by the incandescent coke, and this performs the bulk of the work. The final meeting of the spongy iron in the zone of fusion and the fusing together of the earthy matters to form the slag are the last steps in the process.

The quality of the product is dependent mainly upon the composition of the slag and the temperature of the furnace, and by varying either it is possible to change the character of the iron within well defined limits. The temperature of the furnace can be to a certain extent regulated by the temperature to which the blast is heated before entering the furnace, and the composition of the slag can be governed by using an amount of flux that will combine with the earthy matters of the ore and fuel to produce a resultant slag of the desired chemical composition.

In the manufacture of foundry iron the two principal points before the furnaceman are the putting of as much silicon as required into the iron and the elimination of as much sulphur as possible in the slag. The metallurgical conditions that favor high silicon are high temperature and an acid slag, while the conditions that favor low sulphur are high temperature and a basic slag. It can be seen, therefore, that while one condition, that of high temperature, is conducive to the attainment of both high silicon and low sulphur, the other conditions are diametrically opposed. This complication is the principal one that confronts the furnaceman, and requires the closest watching to prevent the furnace producing an undesirable iron. This complication also furnishes certain sets of conditions that produce entirely different results, for by changing the composition of the slag; that is, by making it more acid or basic, by reducing or increasing the limestone, and by changing the temperature at the same time, we can produce an iron containing high silicon and low sulphur; an iron containing high silicon and high sulphur; an iron containing low silicon and low sulphur, and an iron containing low silicon and high sulphur. While the first result is the one aimed at in the production of foundry iron, it is not entirely possible at all times to prevent the furnace from producing either one or all of the others occasionally, according to conditions. If the raw material used had at all times a certain chemical composition and a uniformity of physical structure, the production of a uniform class of iron would be possible, but unfortunately great irregularity in both obtains in all but a few well favored localities, and this irregularity naturally affects the furnace unfavorably, or militates against its uniformity. In addition to the sulphur and silicon, phosphorus and manganese play a very important part in foundry iron, and their control is part of the furnaceman's problem. As phosphorus is practically entirely reduced and combines with the iron under all circumstances, it is controlled entirely outside the furnace by mixing the ores according to their phosphorus content in proportions that will cause the phosphorus in the iron to fall within the specified limits.

Manganese is not subject to absolute control, as under all conditions part of it goes to the iron and part of it enters the slag as oxide of manganese or as a manganate. The conditions that favor the reduction of manganese and its absorption by the iron are high temperature and basic slag, so that while the high temperature which tends to produce high manganese at the same time produces high silicon, the basic or limy slag which tends to produce low silicon produces high manganese. When the manganese content in the ore is not over 1.00 or 1.50 per cent it is not of much moment, as there is not sufficient manganese to give trouble one way or the other, but when it rises to 2 or 3 per cent, it is necessary in producing a good foundry iron to

make the slag as acid as possible without endangering the absorption of sulphur by it, in order to keep the manganese within limits in the iron. When operating in this way the lower the temperature falls the less manganese enters the iron, so that the lower the silicon in the iron the lower the manganese, and as a lowering of temperature with a slag that is not very limy promotes high sulphur, it is also true that the lower the manganese the higher the sulphur in the iron.

The amount of carbon absorbed by iron in the blast furnace is entirely a matter of conjecture from an operating standpoint, and while we can tell with reasonable certainty the amount of total carbon the iron will contain, we are not able to govern it. We know that high temperature and high manganese favor the absorption of carbon, but we also know that the excess of carbon absorbed under these conditions is immediately separated upon reaction of temperature and is thrown out by the metal as free graphite or "kish." The condition of the carbon which permanently saturates the iron is dependent mainly upon the amount of silicon and sulphur the iron contains, and by these is to a great extent governed, but not entirely so. Generally speaking, if we produce an iron that contains high silicon and low sulphur we will have an iron that contains nearly all of its carbon in the form of graphite; but as manganese, the temperature of the iron as it leaves the furnace, its rate of running, and the manner of cooling, all have their effect upon the carbon condition we are not certain as to the final result and have no exact means of controlling it. As foundrymen desire an iron that will show to the least degree the effect of sulphur additions from the fuel in the cupola, it is incumbent upon the furnace man to produce an iron containing as much graphite and as little combined carbon as possible. As we know that by running the iron high in silicon, low in sulphur and containing about 1 per cent of manganese we will most nearly meet the required conditions, we seek to control only the last three and through them obtain a species of control of the carbon. Some foundrymen insist upon specifying the percentage of graphitic and combined carbon, as well as the percentage of silicon, sulphur, phosphorus and manganese in the irons they purchase, which is a refinement that is not only unnecessary but in some cases even absurd, for the reasons indicated. It is well enough to desire to use an iron containing a certain percentage of combined carbon or graphite, but in case these are specified, fixed percentages of the other elements should not be insisted upon. Furthermore, until we understand with greater clearness the exact nature of the iron carbides in pig iron, and have at hand more ready and direct means of determining them with rapidity and accuracy in the laboratory, their amount should not be specified, particularly as the results desired can be secured with a greater degree of certainty through our more accurate information about the elements silicon, phosphorus, manganese and sulphur, their influence on carbon conditions, and our ability to more quickly and accurately determine them by chemical means. As we gradually depart from the old method of classifying pig iron by its physical appearance, or by the character of the surface of a fresh fracture, we cannot lose sight of the fact that the chemical composition of the iron has a marked effect upon its physical characteristics, and today while many foundrymen who have been educated and trained to the use of pig iron according to its physical appearance, have yielded to the modern advance of thought and knowledge to the extent of taking chemical composition into account and specifying the constituents to meet their needs, they yet tack on the grade to be sure they are right. This multiplicity of specifications furnishes a difficult problem for the furnaceman that finds no ready solution. While as just stated the physical appearance of pig iron is to a certain extent influenced by the chemical composition, the influence of the latter is not evidenced in the same manner at all times, nor does the physical appearance furnish a safe guide to its estimation. It is equally possible to make a No. 1 X iron containing 1.50 per cent silicon, and a Gray Forge iron containing 3.00 per cent silicon. While these extreme conditions are usually brought about by variations in the sulphur and manganese, there are other conditions arising from irregularities in the internal condition of the furnace which modify the form of reduction, and influence strongly the physical appearance of the iron without greatly modifying its chemical constitution. Such conditions as a slight accumulation on the walls of the furnace which reduces its area and allows a portion of the ore and stone to descend to the tuyeres without having undergone the necessary chemical changes, or causes a freer working on one side than on the other, very

markedly influences the physical character of the iron, while the furnace is properly burdened to produce and does produce iron of the proper chemical analysis, so long as the proper temperature is maintained.

The amount of moisture in the air also has a distinct effect upon the physical appearance of the iron, and to some extent effects the chemical analysis, so that in the warm months when there is less oxygen by volume and a greater humidity in the atmosphere, a greater volume of air is required for the furnace and a greater amount of coke is uselessly consumed in dissociating the water vapor at the tuyeres, Under these conditions it is more difficult to produce the highest grades of iron, as the furnace is more sensitive to any changes that may occur at the top.

Of all material charged into a furnace, the fuel has the greatest bearing not only upon the working of the furnace from a standpoint of tonnage, but also upon the chemical composition of the iron. While the ores are subject to variations that sometimes give rise to unusual conditions, it is not often that these variations cannot be met promptly in a way that will quickly restore the conditions to normal, variations in the fuel cannot be so promptly met and as a consequence have a more marked and lasting effect. It is not often that the ores contain sulphur in excess of an amount readily carried away by the slag, so that practically all the sulphur in the iron is obtained from the sulphur that exists in the coke. The lower the sulphur is in the latter element the more regular are the results, but as a rule the exact chemical analysis of a coke is not so important in blast furnace practice as is its physical structure. The percentage of ash in the coke seems to have a distinct bearing upon its strength, and the writer has from a long series of observations reached the conclusion that coke which contains from 9 to 12 per cent of ash gives the most satisfactory results in the furnace. Since variations in the manner of charging and firing the ovens in the coking process produce marked variations in the physical character of the resultant coke, the latter presents a lack of uniformity that reacts on the furnaceman to the extent of causing undesired changes in the condition of the furnace. Even from the same burning at one set of ovens the coke is subject to considerable variation unless that operation is managed with a rigidity of system that does not obtain at the majority of the collieries. As just indicated it is certain that the percentage of ash influences the physical structure of the coke, and it may be possible that this influence is not confined to only this one constituent of the chemical composition, but however this may be it seems that the manner in which the coal is prepared and coked has the greatest influence upon the physical characteristics and to the greatest extent determines the value of the coke as a furnace fuel. Coke having an apparent specific gravity of from .90 to .95 yields the most satisfactory results in the writer's experience, as coke having this specific gravity has its cell structure sufficiently well developed to allow free access to the gases, and at the same time has a sufficiently great strength to resist the crushing effect of the furnace burden. When coke meets these conditions it is not a matter of great difficulty to secure uniform results from the furnace, as the porosity of the coke and its strength keeps the column of stock in a loose condition, allowing free play of the gases and promoting regularity of movement. A change to a harder or denser coke retards the reaction in the top of the furnace on account of the gases having less ready access to the interior of the lumps, and as a consequence too little carbon is freed for deposition in the ore in the upper parts of the furnace, and an excess of coke reaches the tuyere line. A change to a softer and more porous coke on the other hand also retards the reactions in the upper part of the furnace, through the crushing down of the burden and formation of a denser column for the gases to pass through. As the gases seek the lines of least resistance this condition promotes the formation of scaffolds or the accumulation of more or less infusible masses on the walls of the furnace, which militate against the production of high grade iron, and in some cases cause the furnace to be put out for cleaning. From these statements, it may be seen that with good coke and poor ores better results may be obtained in the production of foundry iron, than with good ores and inferior coke.

As the operation of the blast furnace is a continuous process, suspended only in the case of accident or for a few minutes at intervals for the purpose of tapping the metal, and as each variation in the nature of the raw materials charged causes variations in the reactions in the upper part of the laboratory of the furnace, it follows that variations are almost constantly occurring in the nature of the

metal collecting in the crucible of the furnace. While these variations may be only slight under ordinary conditions, they are nevertheless variations, and the body of iron that is tapped out at a cast is composed of layers of iron that in some cases have very marked differences in chemical constituents and also differences in physical characteristics. There is no rule by which we can tell what these differences may be except by noting the condition of the furnace at short intervals during the time the iron has been formed, and even in this way it is only a matter of judgment. The writer has noted a variation of 1.27 per cent in the silicon, and .028 per cent in the sulphur in a cast of nineteen (19) beds of twenty-five (25) pigs each, taking three pigs from each bed and analyzing separately. No variation in the phosphorus was found, and only .30 per cent variation in the manganese. The average analysis of the whole cast was: Silicon 2.08, sulphur 0.39, phosphorus .760, and manganese .72 per cent.

While a variation as wide as this may be unusual, it is a matter of fact that no two beds of iron will analyze exactly alike, and it is this variation that very frequently creates controversies between the manufacturer and the consumer, as the manner of sampling causes variation in results, more so especially when some of the conditions named have caused numerous slight changes to occur in the working of the furnace in short periods of time. As it is not feasible to analyze each bed of iron on account of the time required the furnaceman secures his analyses from small samples dipped at intervals from the runner, and analyzes them separately or combined according as the furnace may be working irregularly or regularly. The information derived in this manner furnishes the basis for the classification of iron and determines its destination. As it is not possible to entirely overcome all irregularities in foundry iron the furnace should be given sufficient latitude in the matter of specifications to allow for reasonable variations.

In this connection it may be stated as a general proposition that a furnaceman should be allowed the widest limits possible, particularly as regards silicon and sulphur, and that the foundryman should be made acquainted with all the small variations in each car of iron to the fullest extent of the furnaceman's information.

NEW TRADE CATALOGUES.

The Nernst Lamp Co., Pittsburg, Pa., has recently brought out a new catalogue entitled the Nernst Lamp. As Nernst lamps are being introduced in many large foundries and manufacturing concerns, this will prove interesting to foundrymen as it gives a thorough and scientific explanation of the Nernst lamp and its application to actual conditions. It is more in the nature of a treatise on Nernst lamps than in the nature of a trade catalogue.

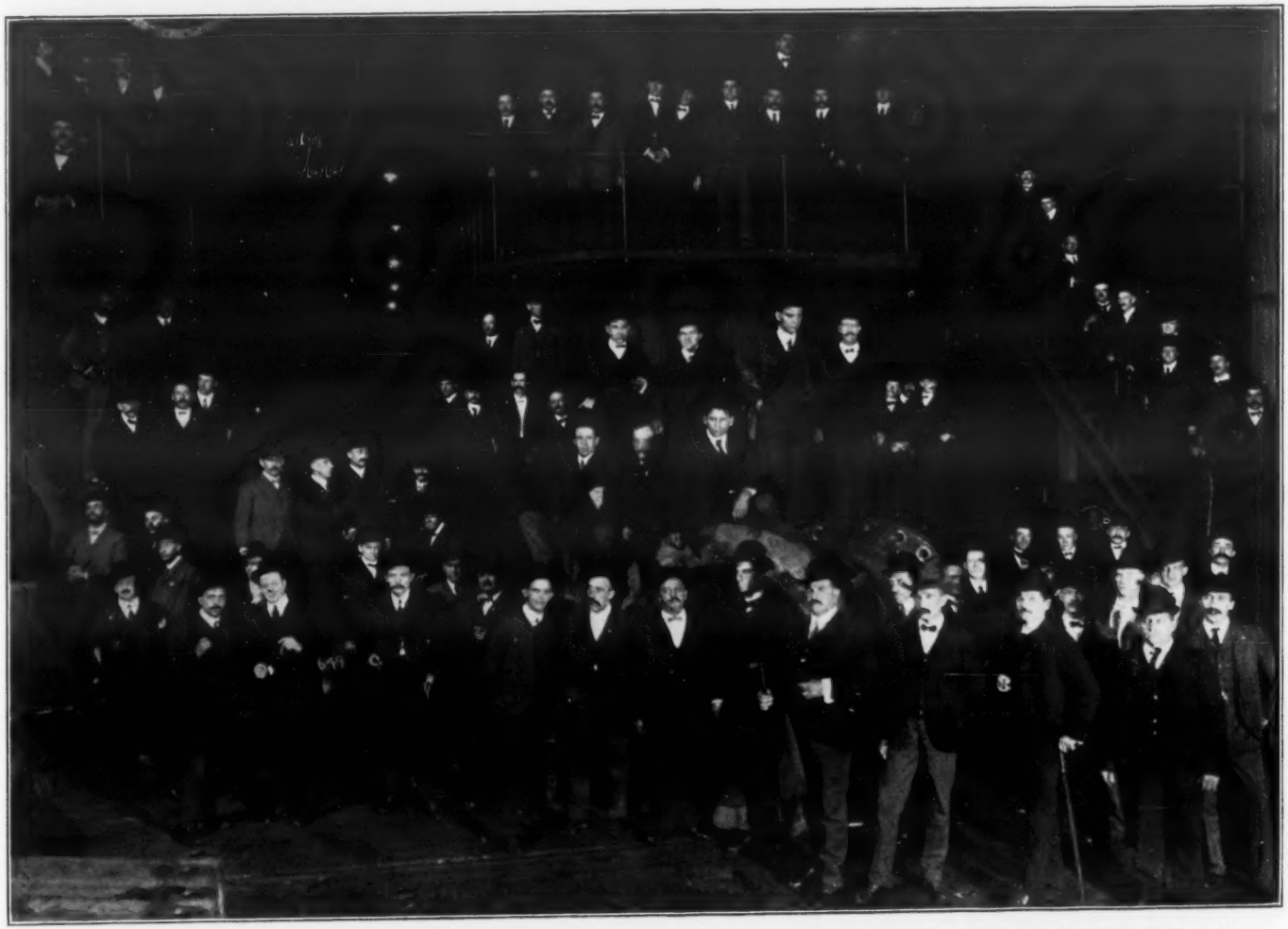
The Tabor Mfg. Co. of Philadelphia, Pa., has gotten out a new catalogue of molding machines. The catalogue is fully illustrated with half-tones showing the machines and their uses. The description is very full and will be of interest to any founder who has molding machine problems to solve.

The Ingersoll-Sergeant Drill Co. has issued a new catalogue treating specially on rock drills, mining and quarrying machinery. While this catalogue is very full indeed upon these special lines, it only touches incidentally upon the use of compressed air for manufacturing concerns and for purposes in which the foundrymen will be especially interested. To any one, however, who is interested in the use of compressed air in mining operations, this catalogue would be of very great interest. It is entitled catalogue No. 43, and can be obtained from The Ingersoll-Sergeant Drill Co., New York City.

Charles G. Shepard, 401 Ellicott Square, Buffalo, N. Y., has published a very neat pamphlet entitled "Globe Pig Iron." It gives the advantages of this brand of pig iron, some fine half-tone illustrations of the fracture and statements of approximate analysis of his iron.

The Yale & Towne Mfg. Co., whose offices are at 9-13 Murray Street, New York City, have issued a neat little pamphlet entitled "Triplex Hoisting Hints." The pamphlet is very artistically gotten up and contains a series of illustrations showing application of these blocks to various classes of work. The publication will be suggestive to any one who has hoisting or transportation problems to solve.

The Cleveland Crane & Car Co., of Wickliffe, O., have recently published four neat catalogues describing their electric cranes for foundry and shop use. The first, entitled Bulletin F, describes an Armington electric hoist for use in connection with trolley or crane systems. Bulletin G describes the Cleveland cranes both hand and electric. Bulletin H describes the Cleveland hand power traveling cranes. Bulletin J describes the Cleveland electric traveling cranes. All four catalogues are very nicely illustrated.



MEMBERS OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION AT THE PLANT OF THE MESTA MACHINE COMPANY, WEST HOMESTEAD, PA., OCT. 5, 1903.

MEETING OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION AT THE MESTA MACHINE COMPANY'S WORKS.

The regular annual meeting of the Pittsburg Foundrymen's Association was held at the office of the Mesta Machine Co., West Homestead, Pa., on the evening of Monday, October 5, the association being the guests of the Mesta Machine Co. About 75 persons were present and visited the pattern department, laboratory, foundry and machine shops of the company. After visiting the works luncheon was served and then the regular annual meeting was held. The following officers were elected for the ensuing year: A. W. Slocum, president; S. H. Stupakoff, vice president; J. S. Seaman, treasurer; F. H. Zimmers, secretary. The new Executive Committee consists of William Yagle, G. C. Schade, S. V. Sleeth, J. S. McCormick and D. J. Thomas. Mr. Slocum made an address pointing out the important position occupied by the foundry interests of Pittsburg and urging the members of the association to meet regularly and give the association the benefit of their knowledge of foundry practice by encouraging a free interchange of ideas and the discussion of papers. The secretary read a letter from the Westinghouse Machine Co. inviting the members of the association to visit the new foundry at Trafford City, Pa. on Saturday afternoon, October 17. The invitation was extended through W. A. Bole, superintendent of the Westinghouse Machine Co's Works. A vote of thanks was tendered to the Mesta Machine Co. by the society for their entertainment. While visiting the works, a photograph of the visitors was taken and is shown in the accompanying cut.

MEMBERS OF THE PITTSBURG FOUNDRYMEN'S ASSOCIATION AT THE PLANT OF THE MESTA MACHINE COMPANY, WEST HOMESTEAD, PA., OCT. 5, 1903.

MEETING OF THE MANUFACTURERS' ASSOCIATION OF PITTSBURG.

The Manufacturers' Association of Pittsburg, composed of founders and machine shop owners, banqueted on the night of October 12 at the Union Club in the Frick Building. About 65 members were present. I. W. Frank acted as toastmaster. The guests of honor were F. F. Du Brul, of Cincinnati, commissioner of the National Trades Association; John A. Penton, of Detroit, commissioner of the National Founders' Association; Paul Blatchford, of Chicago, secretary of the Chicago Metal Trades Association.

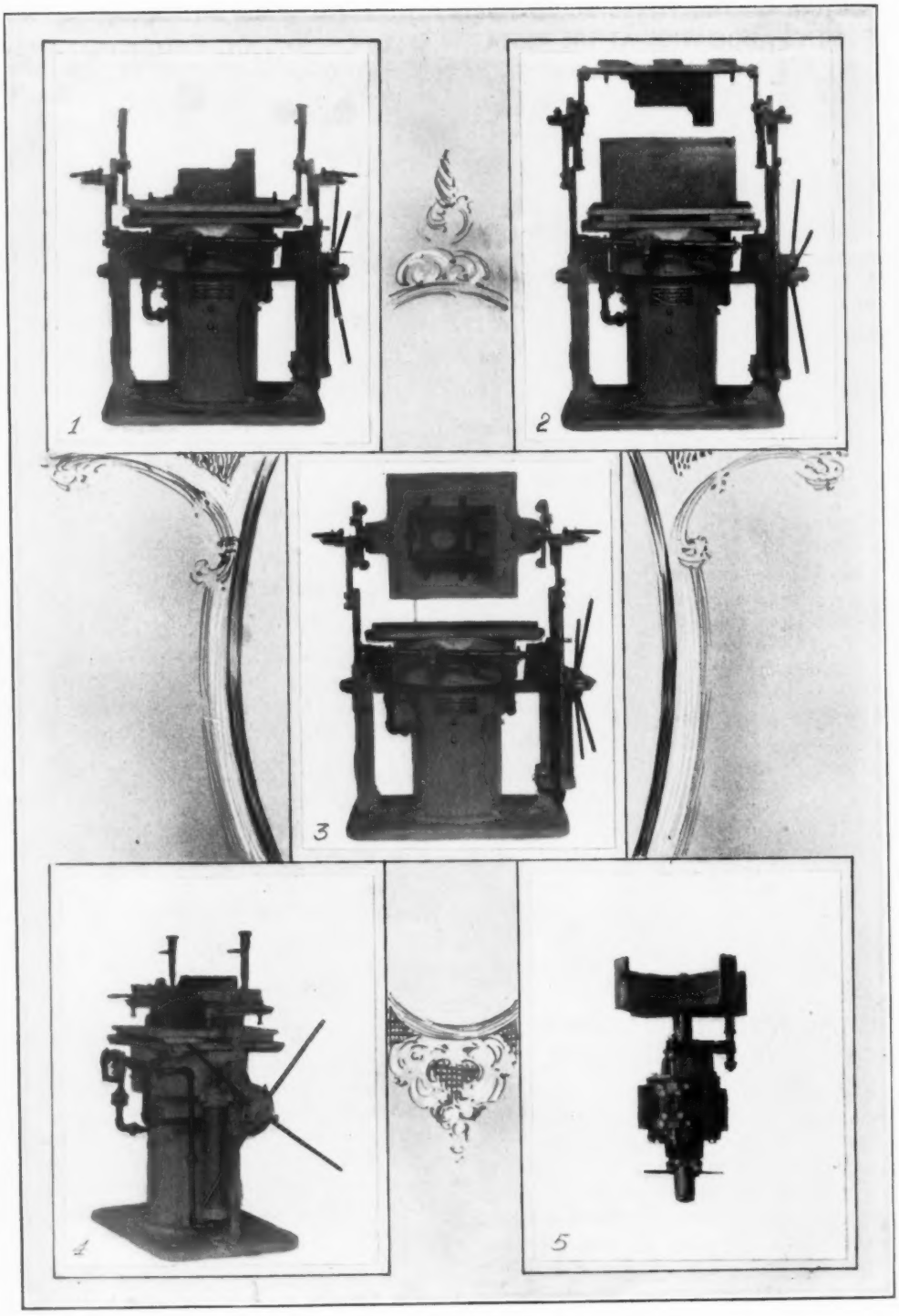
NEW BOOKS.

IRON, STEEL AND OTHER ALLOYS by Henry Marion Howe, published by Sauveur & Whiting. Price $5.00. This book certainly fills a long felt need in the literature of metallurgy. Those who wish to familiarize themselves with the most recent practice and methods of treating various alloys and metals will find the book a very valuable addition to their library. In the preface the author states that he had several very different classes of readers in mind when writing the book. 1st: There were his students in metallurgy, some of whom required but a small amount of information concerning it and some of whom wished to go into it exhaustively. 2nd: The book was prepared for the practical man who wished information concerning the work which had been done in the field covered. He first treats the subject in a general manner showing the resemblance of alloys to other common substances. The subject of cooling curves is next taken up and the manner in which this graphically illustrates what is going on in the mass under consideration is fully treated. Eutectic alloys are fully treated; the metallegraphy of iron and steel is then taken up; the heat treatment of iron and steel, manufacturing of iron and blast furnace practice are also treated. The treatment of blast furnace practice is limited, as the book treats of the behavior of iron and steel rather than the manufacture of iron and steel. The work is illustrated by half-tones, charts and drawings which make the text very clear.

MEETING OF THE NEW ENGLAND FOUNDRYMEN'S ASSOCIATION.

The New England Foundrymen's Association visited the plant of the B. F. Sturtevant Co. at Hyde Park, Mass., on the afternoon of Wednesday, October 14. In the evening a paper on the Tropenas Steel Process for castings was read by Arthur Simonson, of Philadelphia. It was announced that Mr. Richard Viall, of the Brown & Sharpe Mfg. Co., Providence, would present indenture papers for coremakers' apprentices with a view of getting uniform practice among foundrymen.

The foundry and machine shop which has been in operation at Clarissa, Minn., has been sold to the Itasca Lumber Co., and they will move the machinery to Deer River, Minn.



PNEUMATIC JARRING MOLDING MACHINE.

PNEUMATIC JARRING MOLDING MACHINE.

A molding machine differing in some respects from any on the market is being manufactured by Charles Herman & Son, of a suburb of Pittsburg, Pa. The machine was invented by Charles Herman. While there are many methods in use on power molding machines for the purpose of settling sand about the pattern, this machine is the only one on which the jarring principle is utilized. The machine may be operated either by compressed air or steam. Molds with patterns from one to twelve inches in height can be rammed in from ten to fifteen seconds without the aid of hand ramming. In the larger sizes of machines molds whose weight, including the patterns, is 1,200 pounds, can be made.

Four views of the machine are shown in the accompanying illustrations. Fig. 1 is a front view of the machine, with the molding board and pattern in place. Fig. 2 is a view of the machine with the mold turned over and the pattern withdrawn. Fig. 3 is a front view of the machine, showing the pattern plate in a vertical position. Fig. 4 is an end or side view of the machine, while Fig. 5 shows the jarring mechanism. The stripping plate used with the machine is not shown in any of the illustrations.

The machine is supported on a base plate, upon which there is a jarring block. Extending up from the base plate around the jarring block there is a cylindrical casing which is secured to the base plate by bolts. Fitting over the upper end of the casing is a cover, provided with a flange, which extends down over the cylindrical casing. The pattern plate is provided with lugs or pins for supporting the stripping plate and guiding the flask into place. Within the cylindrical casing is the jarring mechanism, which is shown in Fig. 5. This consists of a central post, secured at its upper end to a crosshead, which slides on guides on the inside of the cylindrical casing and carries the plate which supports the mold, together with the flanged casting which extends down over the top of the cylindrical casing. When in its lowest position the lower end comes in contact with the jarring block located in the center of the base plate. Fitting around the post or shaft is a stationary cylinder, which is attached to the cylindrical casing extending up from the base plate. This cylinder is provided with a valve chest within which there is a slide valve, which controls the admission and exhaust of the air or steam. A piston is attached permanently to the post and causes the post to ascend or descend as the air is admitted to the cylinder above or below the piston. Connected to the slide valve is a valve stem which extends through a packing box on the upper end of the valve chest and is provided with nuts at its upper end, between which the forked end of a rocking lever extends. This lever is pivoted to a standard screw to the upper cylinder head. The opposite end of the lever is also forked and extends around a rod extended down from the crosshead. When in operation, the piston and crosshead are raised by admitting air below the piston, the pattern plate, stripping plate and flask being carried up with the piston and post. As the crosshead is raised the rod connected with the rocking lever throws the valve in such a way as to cause the air in the lower end of the cylinder to exhaust, while the working fluid at full pressure is admitted above the piston. This causes the post to descend rapidly and strike the jarring block.

The machine when in operation is set so that it will strike about 120 blows per minute, or two blows per second. Sixteen to twenty blows are generally sufficient to set the sand in an ordinary sized mold. In operating the machine the stripping plate is placed over the pattern and the flask placed in position. The flask is then filled with sand and the valve of the supply pipe admitting air to the valve chest is opened, when the series of operations already described will take place; that is, the air will raise the mold until the valve mechanism cuts off the supply, when the mold will descend rapidly until the central post strikes the jarring block. These operations will be automatically repeated until the supply of air is shut off. After the mold is rammed it is raised, turned over, the pattern drawn out through the stripping plate, this part of the work being accomplished very much as in other types of molding machines.

Inasmuch as the parts of the jarring mechanism are confined within the casing, and the cover with its flange always encloses the upper part of the casing in all positions, the machine is rendered practically sand tight, thus protecting the working parts. Patterns that have to be molded flat on other power ramming machines can be molded upright on this machine. By the jarring operation the sand is rammed hardest about the pattern and the mold is not so hard near the top, so that little or no venting is required.

The largest machines require a pressure of

60 pounds, while the smaller machines require proportionately less. The pattern shown in the accompanying illustrations is 10 inches long and 8 inches high.

PERSONALS.

Mr. F. S. Cadwell has resigned his position with the Michigan Heater Co. and accepted a like position with the Union Steam Pump Co., of Battle Creek, Mich.

Mr. J. K. Merrin, secretary and treasurer of the Tampa Foundry & Machine Co., Tampa, Fla., had his leg broken on October 7, while overseeing the loading of a carload of machinery.

Henry J. Waldorf, who has been in charge of the radiator department of the Kewanee Boiler Co., has accepted a position at the head of a large malleable foundry at Bridgeport, Conn. Mr. Waldorf's place at the plant of the boiler company is taken by A. W. Cochrane, of Detroit.

Andrew Bruse, foreman of the foundry at the Thomas Mfg. Co., Springfield, O., was surprised by a number of his workmen who called on him and presented him with a ring, as a token of the esteem in which he is held by his many employes.

Mr. I. G. Haswig has resigned his position as foreman of the Belleville Stove Works and accepted a position as general superintendent of the Willard Stove & Range Works of Belleville, Ill. He will be succeeded in his old place by Jas. Little, of the Thos. White Works, Quincy.

Mr. J. L. Mishler, who for the past five years has been in charge of the accounting department of the Kelly Foundry & Machine Co.'s offices, has resigned his position to accept a position in Chicago in charge of the accounting department of White's Class Advertising Co.

Capt. A. M. Blakesley has disposed of his interest in the Rock Island Stove Co., Rock Island, Ill., to his partners, and has started for California, where he will spend the winter. Captain Blakesley retires from active business on account of the condition of his wife's health. He has been a resident of Rock Island 26 years, and during all that time has been identified with the Rock Island Stove Co. Most of the patterns turned out by the company have been of his design.

Franklin Farrel, Jr., has gone to work in his father's foundry in Ansonia, Conn., as a laborer. His object is to master the foundry business. He is a graduate of Yale and while there won distinction in a number of lines and was always a favorite among his fellows. He is following the regular rules of the works in regard to hours and doing the work of the laborer. It is his ambition to become head of the great concern that bears his father's name, and he realizes that in order to be master of the situation he must understand the details. All connected with the foundry business should welcome anyone of wealth or culture when he is willing to learn the business from the ground up, as such a man will understand the workingman's condition far better and be in a much better position to treat him fairly, sympathize with him and carry on the work in a manner profitable both to the employer and the employe. The step requires both pluck and determination, for when a man owns his automobile, yacht, and horses, and has every opportunity for enjoying the so-called pleasures of life, it certainly takes some determination to lay these aside for the work of a common laborer.

DEATHS.

Mr. L. C. Bignall died at the home of his daughter, Mrs. W. B. Robbins, Medina, O., on September 28 at the age of 75 years. He has resided in Medina for a half century, and for a great many years was very prominent in manufacturing lines, being the head of the Bignall Foundry Co.

William McKinley, senior member of the firm of McKinley & Fruack, foundrymen, died early in October at his home in Brooklyn, N. Y., aged 80 years.

Mr. Stephen F. Curtiss of Le Roy, N. Y., died on October 3. For many years he was identified with the business interests of the place. He was born in September 1824, and nearly all of his life was spent in or near Le Roy. At the age of 18 he was apprenticed to learn the molder's trade and for years was engaged in that business. He manufactured stoves for a number of years and later engaged in other lines. For 19 years he served the town as justice of the peace. At the time of his death he was one of the oldest Masons in western New York, having been a member of the lodge for 57 years.

FIRES.

The C. H. Hopke foundry at Rockford, Ill., was destroyed by fire on September 22, with a loss of $100,000.

The Williamson foundry in Covington, Ky., was destroyed by fire, entailing a loss of $2,500. There was no insurance.

The Moline Scale Co., of Moline, Ill., had its frame foundry building gutted by fire on Sept. 24, the loss being between $6,000 and $7,000, fully coverd by insurance. The fire broke out near the cupola and communicated to the loft above. The loss is confined to the building, the patterns and machinery contained therein. Fortunately the patterns lost are mainly those which are not required frequently. The patterns for the jobbing work, that is one of the most important features of the Scale company's business, had been removed to another warehouse only a day or two before.

A serious fire visited Saginaw, Mich., on the morning of September 27, destroying four industries and among them the Bartlett Foundry Co.'s plant. All of the firm's valuable patterns were destroyed.

The foundry of Woodside Bros. at Port Arthur, Ont., was entirely destroyed by fire on Sept. 27. It is thought that some of the hot iron fired the building. The loss will be between $15,000 and $20,000. All the machinery and patterns contained in the building were destroyed. The insurance amounted to only $4,000. The company will begin rebuilding at once, but in the meantime local industries will be handicapped as the foundry was the only place they could go for repairs, especially the tugs and dredges in the harbor.

On the night of September 24, the Danville Foundry & Machine Works at Danville, Ill., was slightly damaged by fire. The loss was estimated at $1,800, fully covered by insurance.

On September 27 the entire plant of the Ferracute Machine Co., of Bridgeton, N. J., was destroyed by fire, the loss amounting to $100,000. It was partially covered by insurance. The company manufactured punching and pressing machinery, making a specialty of fine dies for coins, medals, etc. As a result of the fire over 200 persons were thrown out of work.

On the night of October 8 fire destroyed the machine shop and damaged the foundry of Robbins and McGehee at Live Oak, Fla. The foundry will be rebuilt and started at once, but it will take several weeks to rebuild the machine shop. The loss is estimated at $6,000.

The foundry of Whitehurst & Co., Norfolk, Va., was slightly damaged by fire on the night of October 7.

The Keyless Lock Co., of Indianapolis, Ind., had its foundry and part of its plant destroyed by fire early in October. The damage amounted to about $5,000.

Fire recently destroyed the plant of the Southern Foundry Co. at Owensboro, Ky. Loss $10,000, insurance, $4,000. The plant will be rebuilt.

The Morganfield Machine Shops, Morganfield, Ky., were destroyed by fire. The loss on machinery and buildings is estimated at $8,000; insurance, $4,000.

The foundry of the Interstate Drainage Co., of Algona, Iowa, was recently destroyed by fire. Loss $4,000. The plant will be rebuilt.

Stock rooms, pattern shop and several other departments, composing the entire western half of the Novelty Iron Works, Canton, Ohio, was destroyed by fire Oct. 1; loss about $40,000. This is the second time within two years that the works have been partially destroyed by fire. 150 men are thrown out of employment. The plant will be rebuilt.

Fire on September 27 destroyed the plant of the Williamson Foundry Co., Covington, Ky. Loss $2,500; no insurance.

Fire destroyed a section of the Elliot Frog & Switch Works, East St. Louis, on the night of September 17. Loss will amount to about $8,000.

On the afternoon of Sunday, October 18, the hay storage building of the United States Cast Iron, Pipe & Foundry Co., Birmingham, Ala., was destroyed by fire; 200 tons of hay were stored there. The estimated loss is $5,000. Fortunately there were two carloads of hay in the yard not yet unloaded, and this will enable the works to continue until a big shipment already ordered gets there.

The Bridgeford & Co.'s foundry at Louisville, Ky., was visited by fire on October 18. The fire destroyed the pattern building.

The plant of J. K. Petty & Co., Lebanon, Pa., was entirely destroyed by fire on October 18. The plant consisted of boiler shop, erecting shop, foundry, blacksmith shop, pattern house, boiler house and engine room. Loss about $30,000.

The shops of the Hackensmith Wheel & Mine Car Co., Irwin, Pa., were destroyed by fire on October 9. Fortunately the company had just completed its new works at Penn Station, Pa., and is now installing machinery. It is hoped that the new plant will be in operation early in November so that the customers will not be greatly delayed in the filling of orders.

NEW CONSTRUCTION.

The Singer Mfg. Co., South Bend., Ind., is adding a one-story foundry 40x400 feet. Other improvements are also in progress about the works.

The Denver Steel Castings Co. has been incorporated at Denver, Colo. The company is capitalized at $500,000, $250,000 of which is to be disposed of at once in the form of contracting bonds. The receipts of these bonds are to be used in procuring a site and constructing the necessary buildings, and also for a $50,000 working capital to begin with. The company is said to have secured 30 acres near Denver upon which it will erect a foundry 130x247 feet, power house 40x98 feet, a pattern shop and storage room 35x119 feet, together with other buildings for machine shop, laboratory, offices, etc. The maximum capacity of the new plant will be 25,000 tons per year, which is equivalent to a business of $2,500,000 yearly. The maximum force of men required will be 500.

The Ohio Valley Steel Foundry Co.'s new plant at Paden City, W. Va., expects to begin work November 1, 1903, though it will probably be January 1, 1904, before all departments are running full force. The main building of the new company is an all-steel structure 79 x 600 feet, with an addition 60 x 200 feet. In the northern end of this building will be located a foundry department covering a floor space 79 x 300 feet. In the southern end will be located a blooming mill. Adjoining the foundry and mill building will be an open-hearth department 60 x 500 feet. In this building will be located four basic open-hearth furnaces and one acid open-hearth furnace. The plant will also be provided with necessary power station and other buildings. The entire plant will be lighted by electricity. Between 600 and 750 men will be employed. It is expected that the foundry will be working double term to its full capacity by December 1, 1903.

The Milwaukee Bridge Co. will build a foundry costing $2,000 on Thirty-fourth Street near Concordia Avenue, Milwaukee, Wis.

The Ashland Steel Range Co., of Ashland, O., is preparing to add a foundry to its plant located on the Erie Railway, that city. The building will be 55 x 100 feet.

The new Vulcan foundry at Winnipeg, Manitoba, is nearing completion and it is expected to be ready for occupancy about the middle of next month.

The Black-Clawson Co., of Hamilton, have commenced work on a new foundry building 55x280 feet adjoining its present foundry. It will also erect a new power plant and office building.

Work has been begun on the new addition 60 x 60 feet to the foundry of the Frank C. Patten Co., of Sycamore, Ill. The foundry is way behind in its orders and the work of completing the addition is being hurried. The company builds gasoline engines.

B. B. Potter, president of the North Star Iron Works, Griffith, Ind., has purchased a site at Hammond, Ind., and will erect a foundry and machine shop.

The new addition recently built to the plant of the Pioneer Stove Co., Columbus, Ohio, is about completed and will be ready for occupancy within a month. The addition will allow the company to almost double its capacity.

J. A. & P. E. Dutcher will build a foundry at Clinton St., Milwaukee, at a cost of $8,000.

The Georgia Car & Mfg. Co., has very nearly completed an iron foundry at Savannah, Ga. The plant was built at a cost of $8,000, and will soon be in operation.

The Lattimer-Williams Stove Co. of Columbus, O., has been making extensive improvements in its plant. It has taken over the building recently occupied by the Kentucky Extract Co. and is remodeling it into a stove plant.

The Huntsville Foundry & Machine Works is building an addition to its foundry at Huntsville, Tenn. A number of other improvements are contemplated.

Flum Bros. have completed the erection of their new foundry plant at Hamilton, Ohio. The main molding floor is 60 x 108 feet.

The Bloomfield Mfg. Co., Bloomfield, Ind., has just added a foundry with a five-ton cupola to its equipment.

G. H. Lincoln & Co., iron founders, South Boston, Mass., have been granted a permit to build an addition to their foundry 40 x 30 feet.

The Van Buren, Heck & Marvin Co. of Findlay, O., have purchased a five-acre tract of land on the T. & O. C. and Lake Erie Railroads and will erect new buildings at once. The machine shop is to be 150x250 feet, and the foundry 60x80 feet. It will also erect an office building.

Platteville Foundry Co., of Platteville, Wis., is pushing work on its new plant as rapidly as possible and expect to have several of the buildings enclosed before snow falls. The company intends to manufacture mining ma-

chinery of all classes. The equipment of both foundry and machine shop will be complete and has been ordered at Chicago and eastern points.

The Canadian Shoe Machinery Co. at St. Hyacinthe, Can., is about to erect a foundry at its plant. The company has been reorganized and increased its capital stock from $1,000,000 to $2,000,000.

The Richland Foundry Co., Belleville, Ill., will erect a foundry, consisting of two buildings, one 60 x 150 feet and the other 30 x 80 feet, at a cost of $10,000.

The Salem Iron Works, Salem, N. C., is preparing to erect another foundry especially adapted for handling heavy castings of 10 to 15 tons.

The National Steel Foundry Co., New Haven, Conn., began work on October 12 on a one-story building, 165 x 410 feet. It will cost about $80,000.

The American Range & Foundry Co., of Cleveland, will construct a new foundry at the corner of South Union and Echo Streets. The buildings will be a brick and cost $4,000.

The Racine Boat Mfg. Co., Racine, Wis., will remove its plant to Muskegon, Mich., where it will erect a new machine shop, foundry, and the other necessary buildings.

The Sessions Foundry Co., of Bristol, Conn., have let the contract for a brick pattern storehouse, 50 x 120 feet and four stories high.

Work has begun on the construction of the shops for the Canadian Northern Railway in Winnipeg, by Smith & Sharpe, the contractors. The roundhouse will contain forty-two engine stalls. The machine shop will be 300 x 100 feet; the blacksmith shop 80 x 70 feet; the freight car repair shed 220 x 120 feet; store buildings for machanical department 300 x 50 feet; a large repair shop 120 x 25 feet; foundry 100 x 60 feet, and there will be several small buildings. All will be of fireproof construction.

The McCadden Machine Works, St. Cloud, Minn., is building a foundry, in which it will make its own castings. The company has formerly had its work done by contract.

A. M. Smith, Dixon, Ill., inventor of hoisting machines and elevators, contemplates establishing a foundry at either Dixon, Ill., or Sterling, Ill.

The new brick foundry and machine shop at the Sharples Separator Works, West Chester, Pa., is under roof and will soon be completed.

The Chicago Malleable Co. has begun the construction of a brick building on 120th and Loomis Sts., West Pullman, at a cost of $30,000.

The foundry of the Ingersol plant at Phillipsburg, N. J., is practically completed. The old foundry at Easton, Pa., will be torn down and some of the brick in the buildings used in the construction of the new plant at Philipsburg.

The John Rice Foundry & Machine Co., of Stevens Point, Wis., will erect a two-story brick addition, 20 x 60 feet, to its foundry and will put in a new cupola with cranes and other fixtures.

The Butler Foundry & Machine Co., of Butler, Pa., will erect a plant for the manufacture of a new car coupler and other inventions of Peter F. McCool. About $500,000 will be expended.

When the Allentown Foundry & Machine Works complete the erection of the new machine shop, which is 80 x 200 feet, a large addition will be built to the foundry.

The James Bonar & Co., Inc., of Pittsburg, with a capital of $75,000, have taken over the business of James Bonar & Co., manufacturers of steam appliances, machinists and brass founders. It will continue in the same line and is now erecting a first-class machine shop and brass foundry on Fortieth Street and Allegheny Valley Railway, Pittsburg. The foundry will be modern in every respect and a specialty will be made of the Bonar oil filter. The company will also be in a position to do galvanized iron work. The officers are: James Bonar, president; Reed F. Blair, vice president; Joseph Cawley, secretary; and George G. Seamans, treasurer.

Plans have been completed for a new plant for the Pickering Governor Co., at Portland, Conn. It comprises brass and iron foundries, and the main building is to be 220 x 50 feet, with three wings, each 35 x 100 feet; heavy mill construction.

Perkins & Co., of Grand Rapids, Mich., is going to erect a new foundry, 60 x 80 feet. The building will be of concrete construction.

The foundry of the Shunk Plow Co., Bucyrus, O., is practically completed and the old machinery will be moved into the new shop at once.

GENERAL INDUSTRIAL NOTES.

The creditors of the Southern Car & Foundry Co.'s plant met in Chattanooga and elected Orion L. Hurlbut, Chattanooga, Thomas G. Bush, Birmingham, and Thomas A. Gillespie, Orange, N. J., as directors. The liabilities of the company amount to nearly $1,900,000. All of the plants belonging to the company are to be operated to their full

capacity under the management of the directors. There is enough work ahead for several months in working up material on hand and in filling orders taken before the company was forced into bankruptcy.

The Central Foundry Co., of Bessemer, Ala., started up again early in the month after a three weeks' shutdown to enable the company to dispose of the over supply of pipe on hand. It is believed the plant will continue in operation during the fall.

The Merrimack Iron Foundry firm has been incorporated and is now a corporation with a capital of $60,000. Mrs. Sarah C. Joslyn is president and Clarence H. Joslyn is treasurer and manager. The plant is located in Lynn, Mass.

The foundry of F. G. Miller in Texarkana, Tex., was burglarized on September 27, the thieves carrying away $200 worth of brass. The next day three boys, ranging from 16 to 19 years, were caught by officers in the act of selling the stolen property to a second-hand junk dealer. All of the boys and the junk dealer were arrested.

The Raymond Mfg. Co., of Middletown, Pa., has contracts on hand that will run its plant to the utmost capacity for some time. In the foundry department it is especially busy, having had to secure molders from surrounding towns.

The Anderson foundry at Wheeling, W. Va., was robbed on September 25. The foundry had been closed down for a few days without leaving a watchman on guard. About $100 worth of good belting and $25 worth of brass castings were taken. They have no clue as to who the thieves were.

McKenna Bros. Brass Co., Limited, of Pittsburg, manufacturer of brass goods of all kinds, has been dissolved by mutual consent, and the business will be continued in the future by the McKenna Bros. Brass Co., a corporation.

Representatives of the brass workers of Chicago and all the principal cities eastward have organized a new union to be known as the Independent Association of Brass Workers. The principal object of the association is to abolish strikes in the trade and to settle all disputes between brass workers and their employers by arbitration.

The Richmond Foundry Co., of Astoria, Ill., opened its new foundry Sunday afternoon, September 27, by giving a reception to its employes and friends. Refreshments of all kinds were provided and a good band hired to render selections. Speeches were made and all drank a toast to the success of the new plant. The next day work was commenced in the new plant.

The Cheraw Machine & Foundry Co., Cheraw, S. C., has succeeded the Cheraw Machine Works, of which Mr. W. G. Howard has been owner and proprietor. Mr. McPherson, an experienced mechanic of North Carolina, has become the manager, and Mr. J. W. Maynard treasurer, while Messrs. William Godfrey and J. P. Maynard are directors.

The Western Foundry & Stove Repair Works, of Salt Lake City, Utah, has been incorporated with a capital of $100,000. Charles Loeffler is president and E. H. Smith, vice president, and H. W. Sherwood, secretary and treasurer.

By a deal just closed at Racine, Wis., the Great Western Mfg. Co., of Laporte, Ind., which has a branch in Indianapolis, has purchased the entire plant of the Wisconsin Wheel Works, a company with an output of 36,000 wheels annually and a payroll of 150 employes. The plant will be removed to Laporte.

The Economy Foundry & Machine Co.'s plant, Syracuse, N. Y., has been sold by the trustee in bankruptcy to C. H. Sanford, cashier of the National Bank of Syracuse. The company recently failed. It will be reorganized and the foundry started again.

The Bellefontaine Foundry & Machine Co., Bellefontaine, Ohio, recently incorporated, has elected the following officers: R. T. Tremain, president; Robert Colton, vice president; Chas. B. Harner, secretary and treasurer; Geo. E. Turner, superintendent. Mr. Tremain was formerly of the American Steel Shovel Co. The company has 17 acres located on the Big Four & Ohio Central Railroads, and its buildings are as folows: Main building, 84 x 92; Foundry, 84 x 84; forge and power building, 36 x 58. The plant has been in operation since October 15.

The Horton Mfg. Co., Painesville, O., has closed its foundry on account of the high price of labor and will hereafter buy its castings.

One man was killed and three others injured by being overcome by gas at the plant of the Mahoning Foundry & Machine Co., October 16. A piece of iron became lodged in the cupola and the workmen were overcome while trying to remove it.

The Platteville Foundry Co., Platteville, Wis., has elected the following officers: W. G. Bryant, president; B. F. Huntington, vice

president; Morton Eastmon, treasurer; and W. C. Johnson, secretary. The company will erect new buildings, for which it has already broken ground.

The Moline Scale Co., Moline, Ill., whose plant was recently visited by fire, has purchased a building in East Moline, which it will occupy in the future. A new building will also be erected as an addition to the plant. Moving from the location in Moline is now in progress.

The Mohawk Stove Co., Palatine Bridge, N. Y., has been incorporated with a capital of $150,000. The directors are: H. A. Shafer, Palatine Bridge; F. W. Bauder, Fort Plain; and O. O. Stillman, New Brunswick, N. J.

The foundry of the Fountain City Drill Co., LaCrosse, Wis., has been placed in operation after a shutdown of several months.

S. L. Moore & Sons Co., of Elizabeth, N. J., has resumed operations in its foundries and has been hiring new men.

The Central Foundry & Car Co., of Irvon, Pa., has been incorporated with a capital of $25,000.

The Reynolds-Chalou Foundry Co., of Troy, N. Y., has been incorporated with a capital of $20,000, and intends to manufacture castings, stoves and heaters. The directors are: John Reynolds of Troy, Michael Fallon and James B. Eagan, of Watervliet, and William Quillinan of Cohoes.

The Holyoke, Mass., Valve & Hydrant Co. has been organized with a capital of $100,000, to manufacture valves, brass fittings and hydrants. The officers are: President, F. H. Metcalf; vice president, John J. Sullivan; treasurer, Fred A. Smith; consulting engineer, C. L. Newcomb.

The Kenosha Brass & Iron Works of Kenosha, Wis., has been incorporated with a capital of $10,000. The incorporators are: William Anklam, John B. Benson and James H. Charles.

The Fischer Foundry & Machine Co., Pittsburg, manufacturers of rolling mills, glass works and general machinery, has purchased from C. C. Wais, Cincinnati, O., all patterns, patents, drawings and good will pertaining to his shear and punch business. The new company will continue the manufacture and sale of these goods on a larger scale than heretofore. Mr. Wais will have charge of the shear and punch department.

The Manufacturers' Foundry Co., Waterbury, Conn., has increased its capital stock from $10,000 to $50,000. The new foundry is expected to be in operation by Nov. 1.

The Ashland Steel Range & Mfg. Co., Ashland, O., has purchased equipment for its new foundry, 55x100 feet, now under erection.

The National Steel Castings Co. has been incorporated under the laws of Delaware by H. Lindale Smith, J. R. McQuigg and W. B. Newcomb, all of Cleveland, with a capital stock of $160,000. The company will manufacture light steel castings, using the buildings erected at Ravenna, O., by the American Foundry & Machine Co. The new company's Cleveland office is with Riley & McQuigg, Williamson building.

The new foundry of the D. E. Whiton Machine Co., New London, Conn., manufacturers of chucks, has been completed and a force of molders was put to work last week.

Sterling F. Hayward, of New York City, has been appointed receiver of the Morse Iron Works & Dry-Dock Co., of Brooklyn. The receiver is a director of the company, and was appointed on application of three creditors whose combined claims amount to $3,500. Trouble with labor unions is one of the chief causes of the firm's present difficulties. The bonded debt of the company is $625,000. The unsecured claims amount to $500,000. There are about 200 creditors, the largest being Edward P. Morse, president of the concern, with a claim of more than $200,000. About nine months ago the company was able to meet all outstanding obligations, but there was not sufficient working capital and the creditors agreed to accept notes, the first series of which fell due October 5th. A strike was declared in the yards May 6th, which crippled the company badly. Instead of employing 3,000 men as before the strike, the company has since been employing only 300. The liabilities are estimated at about $1,000,000, and the plant is said to be worth twice that amount. Mr. Morse has built up the business in less than twenty years, having been himself a workman.

An idea of the great cost of the construction of the new plant being built by the Rock Island Railroad, at Moline, Ill., may be obtained by the fact that the Rock Island Improvement Co., a subsidiary concern organized to build the shops, has given the Illinois Trust & Savings Bank of Chicago a trust deed for the sum of $7,500,000 to cover the cost of the construction of the works.

The new plant of the Richland Foundry Co., Belleville, Ill., destroyed by fire a few months ago, has been rebuilt and the first heat was taken off last week.

The Edward E. Squier & Co., St. Louis, has been installing machinery to screen and handle its molding, core and engine sands.

The Toledo Co-operative Foundry Co., Toledo, is about ready to begin manufacturing. One of the products will be anti-friction metal designed for use in railway journal boxes, taking the place of brass journals.

The Delphos Foundry Co., Delphos, Ohio, recently organized with a capital of $50,000, has elected the following officers and directors: President, S. F. Shenk; vice president, H. L. Leilich; treasurer, Theodore Kemker; secretary, T. A. Weger. The directors are: S. F. Shenk, H. L. Leilich, T. A. Weger, Jos. Roth, A. B. King, T. J. Stallkamp, W. J. Steinle, Aaron Fisher, Theodore Kemker.

Lorenz & Louis Mayer, who since 1896 have been operating their foundry and machine shop in Mankato, Minn., as partners, have decided to form a corporation. The new company is to be capitalized at $125,000. The company will sell $50,000 worth of preferred stock, which is to be used in improving the plant and installing new machinery.

The capital stock of the Birmingham Pipe & Casting Co., has been increased from $55,000 to $150,000. The members of the company are: Joseph Winterbotham, J. F. Hatcher, H. K. Spencer, S. S. Knight, E. W. Abrams and E. B. Hatcher.

A number of Toledo capitalists, including John Craig, Thomas Watson and others, are organizing a steel castings company with a capital of $100,000. A site of twelve acres has been purchased on the Terminal Belt line.

The Staw & Patchell Machine & Foundry Co., Charleston, W. Va., has been incorporated with a capital of $25,000. The incorporators are: D. H. Patchell, H. S. Staw, Moses W. Donnaly, Ham Morris, Jr., L. W. Couch, Charleston, W. Va.

The Zeidler Lamp & Brass Co., Fond du Lac, Wis., has been incorporated with a capital of $12,000, to manufacture brass and iron novelties.

Many improvements have been made at West Allis, Wis., during the year. In addition to the immense plant of the Allis-Chalmers Co., the largest of its kind in the world, there are six other large manufacturing plants on the line of Belt railroad. The plants of the Milwaukee Electric Co., The Prescott Pump Works, Chain Belt Co., The Kearney & Trecher Tool Co., and the Shaw Foundry Co. employ about 5,000 men and are steadily going. At the present rate of growth it is expected that West Allis will have a population of 20,000 in two years.

The South Bend Foundry Co., South Bend, Ind., is moving its office to Indiana avenue, and making room for contemplated additions to its foundry buildings.

The Riverside Foundry & Machine Works, Riverside, Cal., have been sold by the proprietor, H. A. Landwehr, to Theodore D. Hewitt. Landwehr has had fifteen years' experience in the foundry business. It is his intention to enlarge the plant.

On October 1st the foundry of Headford & Hitchins, Dubuque, Ia., will be turned over to L. H. Pitts, former superintendent of the Union Electric Co., who will run the plant under the name of the Pitts Foundry & Contracting Co. Fire escapes will be built and a general casting business will be done.

The Enid Machinery & Supply Co., Enid, Oklahoma Territory, recently incorporated with a capital of $25,000, is the consolidation of Olinger & Jett and Amos Funk & Son. Both of these firms have been in business at Enid for the past three years, and the business done in the past by both will be carried on by the new company on a larger scale. The company will have a thorough equipped machine shop and a small foundry, and will handle engine and thresher supplies in a wholesale and retail way.

The plant of the American Foundry & Machine Co., at Ravenna, O., has been sold to the National Steel Casting Co., a concern backed by Cleveland capital and capitalized at $150,000 under the laws of Delaware. The new concern expects to have the plant in operation in a short time.

The firm of J. K. Dimmick & Co., of Philadelphia, will move their office from the Drexel building to the Land Title building. They will move early in December.

The International Steam Pump Co., of New York have decided to move the old Holly Mfg. Co.'s plant from Lockport, N. Y. The clerks and managers were moved to the Snow Pump Works in Buffalo, some time ago, and orders have been issued for the movement of the foundry department to Buffalo by November 1.

A damage suit for claims amounting to $60,000 has been brought against the Pyott Foundry Co., of Chicago, for alleged failure to comply with city building ordinances. It constructed a wooden addition to its foundry and subsequently this burned and set fire to the adjoining candy factory. The insurance com-

pany adjusted the loss with the candy factory but is now suing the foundry company to recover damages from it and it is also said that a later suit will be begun against Peter Kiolbassa, who is city building inspector.

On October 8 a meeting was held at Hamilton, Ont., and the Canadian Westinghouse Co., Ltd., was organized with a capital of $2,500,000. Officers elected were: George Westinghouse, president; H. H. Westinghouse, vice president; F. H. Taylor, vice president; Paul J. Myler, general manager and treasurer; John H. Kerr, secretary.

The Tabor Mfg. Co., of Philadelphia, has opened offices in Manchester, England, and placed them in charge of C. W. Coleman, its British representative.

The Port Huron Engine & Thresher Co., at Port Huron, Mich., has made extensive additions to its malleable department.

The buildings and machinery of the Washington Foundry & Machine Co., Washington, Pa., have been sold to the Washington Chemical and Supply Co.

On October 13 the first heat was run off at the new foundry of the Wickham & Chapman Piano Plate Co., Springfield, O.

R. H. Burton-Smith and Milton Perry Smith have purchased the interests of E. A. Bullock in the Sioux City Mfg. Co., in which the three were formerly interested. This gives the Smiths complete control of the plant. It is their intention to increase the capital and enlarge the plant.

It is probable that the Sebold Foundry & Machine Co., of St. Louis, will establish a branch at Amarillo, New Mexico.

The D. E. Whiton Machine Co., New London, Conn., have started its new foundry and report that everything seems to be very satisfactory, the heats taken being so far entirely successful.

The Finlay Otten Foundry Co., Buffalo, N. Y., has been incorporated with a capital of $50,000. Directors are: F. B. Bard and E. M. France, New York; R. C. Brower, Brooklyn.

The new brick building of the Allentown Foundry & Machine Co., Allentown, Pa., is now under roof and will soon be ready for work.

The Marinette (Wis.) Iron Works, Marinette, Wis., has purchased eight and a half acres of land at Chicago Heights, where it will construct a new plant. The buildings consist of two machine shops, one 80x350 feet, the other 70x200 feet, respectively; a foundry, 80x250 feet; a blacksmith shop, 50x80 feet; a boiler and engine house, 50x75 feet; and a two-story pattern shop 50x100 feet. The Iron Works has been located at Marinette for more than 30 years, and is now moving to Chicago to avail itself of better shipping facilities and to be more centrally located. The plant will be moved as soon as the new buildings are complete.

A new foundry is to be constructed at Red Lake Falls, Minn. A subscription paper was passed among the citizens and necessary money subscribed for the construction of the plant, and it is hoped it will be in operation by spring.

The Lewiston Foundry & Machine Co., Lewiston, Idaho, is going to enlarge its foundry.

It is announced that the Kent Foundry Co., Toledo, O., has been purchased by the recently organized Owens Bottling Co. The plant is to be enlarged to double its present capacity and will hereafter be used exclusively for turning out Owens bottle machines.

The Red Cross Mfg. Co., of Bluffton, Ind., is building a large new fireproof pattern vault at its works and increasing the capacity of its foundry.

The Mills-Gorman Foundry Co., Bridgeport, Pa., recently organized, has taken over the MacGregor foundry which has been in operation nearly two years. The building will be enlarged and new equipment added and the capacity of the works increased.

The Pittsburg Valve & Fitting Co., of Pittsburg, Pa., is thinking of increasing its capital from $300,000 to $500,000 in order to enable it to enlarge its plant at Barberton, O., and adding a malleable department for making valve and pipe fittings.

The Harrisburg Foundry & Machine Works, Harrisburg, Pa., called its managers and outside representatives from their respective places into the works on October 15 to visit the works, and also for a convention for the further interests of the business.

The Universal Caster & Foundry Co., Newark, N. J., has been incorporated with a capital of $350,000. Incorporators are: John Hempel, J. William Ropprecht, August Denchler. The company will manufacture and deal in hardware.

The Harvey Foundry & Machine Co., Chicago, Ill., has been incorporated with a capital of $25,000. The incorporators are: Richard S. Folsom, Dwight Lawrence and John R. Phillips.

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